The
Electrical Review

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Canvass the Country

WHAT would be the effect upon the electrical industry if it were to make a systematic, enthusiastic canvass of the whole country—houses, flats, shops, business houses, public buildings, warehouses, works, and factories?

A second question: Is there any good reason why such a canvass should not be organised practically everywhere at once?

We indulge in a good deal of general optimistic talk regarding the immense scope that there is for electrical development—and it is perfectly true; we spend money upon propaganda designed to make an impression upon everybody's mind—and it is money well spent; we run local exhibitions and travelling shows—and thousands are entertained; we arouse the public interest by unexampled floodlighting—and everybody praises it. In manifold other ways we try to compel the people to think of electricity as a very good thing—just the thing they need. And none of these things should be left undone.

But what about an organised united effort following up all this very desirable activity by something really sweeping in the way of systematic business-getting in every locality where there is, or soon can be, a supply of electricity available?

A week ago we mentioned here that very frequently the consumer was not to blame if his installation was defective or incomplete. Better knowledge of what could easily be done, and adequate facilities for doing it, would lead to improvement in many cases.

The position of the non-consumer of electricity is very similar. The industry stands to gain from more extended uses by existing consumers, but the more urgent case is that of the majority of the people of the country, for they are not yet enjoying any of the benefits of electrical service except those of the most trivial kinds. We believe that there are thousands—hundreds of thousands—of households, business houses, and factories where there is next to nothing electrical installed because the owners or occupiers have never had the electrical truth plainly stated to them from their own standpoint. This ought not to be! It would not continue if every electrical undertaking lived up to its responsibilities. Let us make a bold attack upon ignorance.

By no conceivable stretch of the imagination can a restriction of enterprise be regarded as in the interests of national economy, nor can an enterprising business-getting canvass be considered an extravagance. An electrical consumer is a revenue-producer; revenue-producers justify outlay upon plant, cables, appliances, accessories; this means more work for British people, if we "Buy British," and relief of charges upon unemployment funds. Is not work for everybody one of the biggest ends that we all want to reach to-day?

We urge this matter of a systematic canvass upon all connected with the industry just now, because to an up-to-date electrical mind it seems to be the only reasonable thing to undertake if we are seriously in earnest about our business.

Edison—the Man

EDISON has been in the public eye as an inventor so long and so prominently that Edison the man has been quite overshadowed. As we wrote some four years ago, his industry was a consuming fire, while his physical constitution was equal even to the strain which that industry put upon it. All his inventions were directed towards results which held out prospects of great commercial returns, and wealth came to him. But throughout he cared little for wealth as such, and spent it freely as the stepping-stone to further achievements. He had also the gift, to a rare degree, of inspiring those who were working with him, and this, and his powers as a leader and organiser, played a large part in the success which came to him. His was both a full and a well-rounded career.

An Urgent Call

WE learn, as we go to press, that Mr. L. B. Atkinson addressed a luncheon meeting of sales and publicity managers in his capacity as president of B.E.D.A. in London on Tuesday. The occasion was an exchange of views between those immediately concerned in sales promotion in connection with electricity undertakings. There are few subjects that are of greater importance to the industry, in our estimation, and it is a pity that the proceedings were private so far as the Press was concerned. One aspect of the matter is discussed in our leader to-day. Supplementing what we say there, we wish to stress Mr. Atkinson's statement that unless supply authorities proceed to put their houses in order so that the demand can grow more rapidly, the Central Electricity Board will have to take the matter up and obtain such powers as are necessary to push the sales of current itself. Socialisation Mr. Atkinson believed to be a backward step, but Mr. Pinkney differed. He said that "*we* are not taking our business seriously enough." Perhaps the presence of only fifty delegates instead of 650 is evidence of that fact; perhaps it is due to the lack of publicity given to the event in advance.

Dual-purpose Lighting

INSTINCTIVE recognition of the beneficence of sunlight in health maintenance is supported directly by the acknowledged influence of solar radiation throughout the evolution of the life processes. Indeed, faith in the efficacy of sunlight may soon demand the widespread use of its artificial substitutes. An interesting E.D.A. lecture is reported elsewhere in this issue, and the subject is to be dealt with next month in two addresses which have been arranged by the Electrical Association for Women. Investigation of the subject is gaining in volume and intensity; the fragmentary data which research has so far been able to co-ordinate has already become sufficiently impressive to warrant serious consideration, and the conservative development of an era of dual-purpose illumination, productive not merely of light as an aid to vision, but also of health-promoting radiant energy. While the cure of disease should, of course, be the exclusive concern of the medical profession, the maintenance of health is the responsibility of every art, science, and individual in a position to contribute thereto. Fortuitous circumstance was responsible for the engineer's inheritance of the artificial lighting field, but he who confines himself to illumination simply will play but a minor rôle in future; he must be ready with the foundation on which to build with growing knowledge.

The Long View

THE theme of the address which Sir Hugo Hirst, Bart., delivered on Tuesday as president of the Institute of Fuel was that increased efficiency in utilisation leads to an enhanced demand more than great enough ultimately to counterbalance the amount formerly wasted. This is especially true of a really progressive industry such as our own. Thus, as Sir Hugo reminded us, the advent of the metal filament lamp encouraged consumers to use electricity more freely, which in turn resulted in lower charges. Again, the increased consumption of coal for generating electricity must be attributed to the progressive cheapening of production through the pursuit of higher thermal efficiencies. In regard to railway electrification, the adoption of a more economical form of transport would surely, as Sir Hugo suggests, ultimately be of benefit to the coal industry itself, since the demand for coal depends upon the volume of industrial activity. The conclusion is that no argument against any development is valid merely on the ground that it is likely to cause a temporary falling off in the demand for a commodity.

The Political Engineer

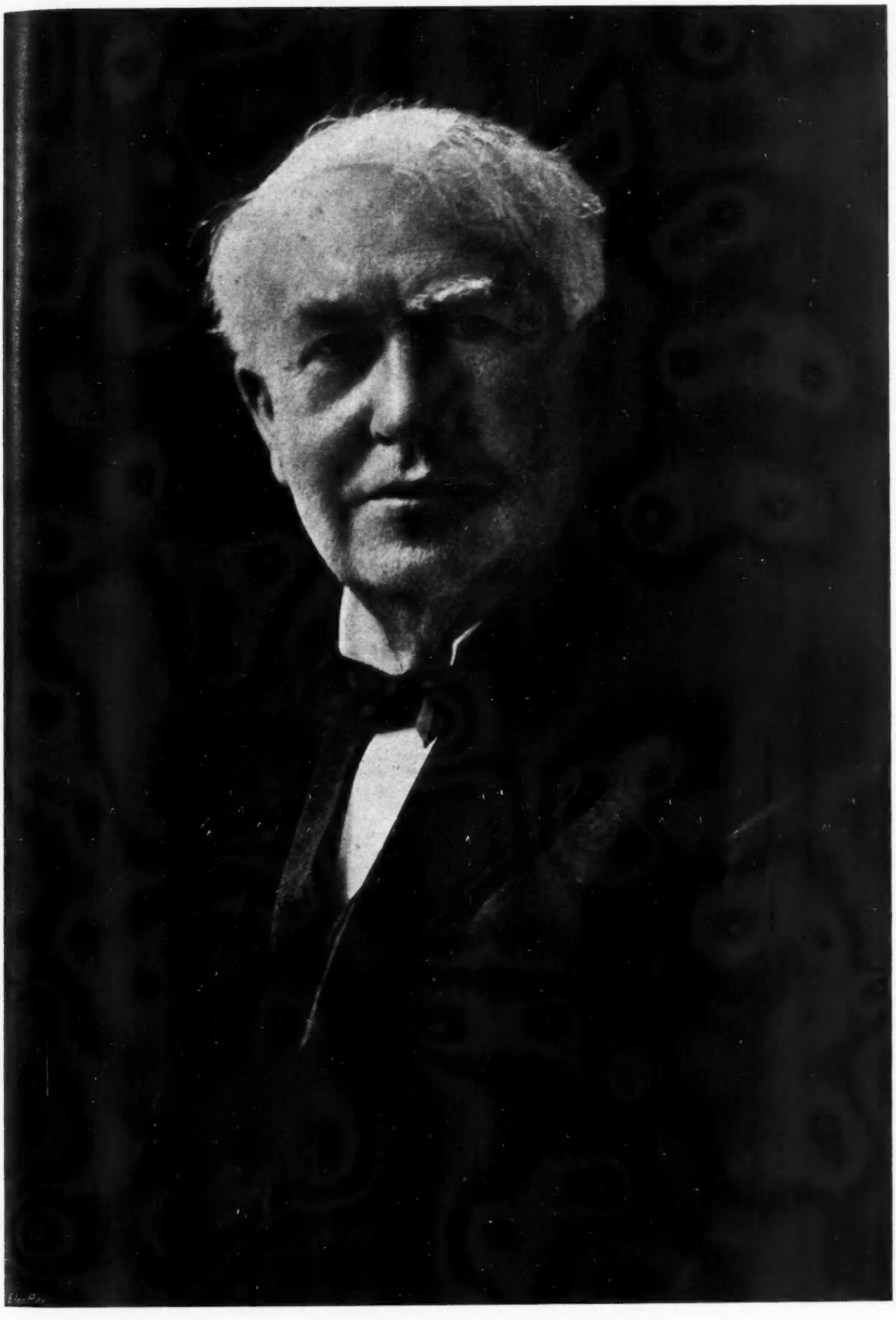
How far an engineer should become actively engaged in politics is a question that naturally arises out of the inaugural address of Major J. Wayne-Morgan as chairman of the I.E.E. Western Centre. A man trained, as the engineer is, to base his estimates on facts, and accustomed to observe strictly the connection between cause and effect, should be an asset in politics. Moreover, in our own branch, the public has come to regard electricity as something vitally affecting its interests, but its representatives cannot be left to work out, without skilled guidance, the principles of engineering application—quite apart from the admittedly expert province of technical detail. By "engineer" we do not mean the man whose heart is in the more highly technical fields of design, and who, indeed, cannot be spared from the work for which by temperament he is best suited. Nevertheless, a very wide range of mental equipment and individual qualifications are required in engineering, which includes in its ranks men well used to weighing questions of broad policy, and who yet retain a fundamentally engineering outlook. It is among these that we shall find our engineer-politicians.

The O.L.A.

AT the annual meeting of the Overhead Lines Association last Friday Mr. W. C. Bexon retired from the presidential chair in favour of Mr. Jocelyn Swan. Mr. Bexon said that, although some headway had been made during his term of office, he had not been able to realise to the full his ambition to see the Association increase its scope and influence. Under Mr. Swan's presidency he expects to see much more rapid progress. The new president, though modestly describing himself as a very young member, has been erecting overhead lines since 1905. He will continue the Association's good work in urging for reform, holding that, if full effect be given to its views with regard to wayleaves and standardisation of equipment for pole lines, much needed progress will be made toward the cheapening of overhead line construction. The O.L.A now has a membership of 228.

A Broad Subject

To review electricity supply development in this country in all its phases, domestic, industrial, and so on, and to deal with the broader question of rationalisation, as well as the electrical engineer's contribution to the development of mankind, all in a comparatively short paper, is to show a spirit of ambitious enterprise. Mr. L. Romero did all this in his chairman's address before the North-Western Centre of the Institution of Electrical Engineers on Tuesday last. We are sure that the job nearest Mr. Romero's heart is that of load building, and we would have liked to have heard him "open out" on that question. It is good to see stressed such points as the necessity for low tariffs, hire facilities for equipment and vigorous propaganda, coupled with reference to the beneficial effects on system load factor, in connection with domestic development.



Thomas Alva Edison
1847 - 1931

A photograph sent us by Mr. Edison with a congratulatory letter nine years ago, when the ELECTRICAL REVIEW celebrated its Jubilee. It appeared in our special issue of November 17th, 1922.

Thomas Alva Edison—the Man and His Work

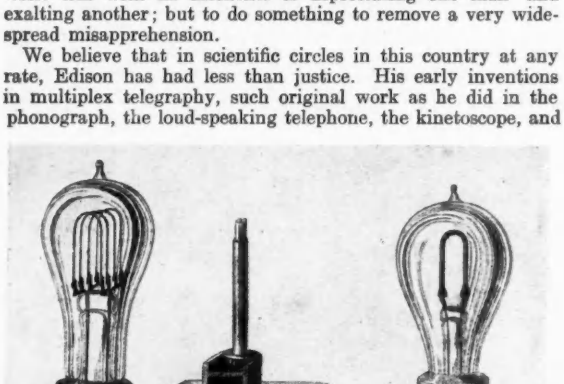
BY the death of Thomas Alva Edison at the ripe old age of eighty-four, the world loses one whose name had almost become synonymous with the title inventor. For more than fifty years—throughout the entire memory of most of us—the great American who died on Sunday last at West Orange, N.J., has been prominently before the public eye as the very type and embodiment of the discoverer; one who by his own ability has greatly extended the boundaries of human knowledge. For this world-wide celebrity, popular journalism must be held responsible; and popular journalism in this respect has done Edison an injustice. For as it has led the public at large to form an altogether exaggerated idea of the range of his knowledge and powers, it has caused a reaction in the world of science, which has tended there to lead us to under-rate the man and his achievements.

Edison was the creature of his time. He appeared at a moment when research was giving to inventors powers of which no one until then had dreamed. Electricity, if the most far-reaching and important, was only one of the sciences which were then emerging; optics and acoustics were in much the same position; chemistry alone had already gone far beyond the others. Any young man born in the middle of the last century in the United States of America, had before him vast fields for the application of these new powers to the convenience and comfort of the race; and gifted as this particular young man was with a rare imagination, a tireless energy, and an organising capacity to make the most of these qualities, it is hardly surprising that his achievements should have astounded and dazzled those who had little time to look below the surface.

Edison and Faraday

Man of science, in the strictest sense of the word, he never was: indeed, he would hardly have claimed the title. The genius of Michael Faraday, which even to-day the ordinary man finds difficult to comprehend, was poles apart from that of Edison. Both had genius; but one sought truth for truth's sake; the other had before his eyes all the time, the utilisation of those truths for the immediate service of man. Everyone can grasp in a moment the claims of a machine into which we can speak and which will give us a repetition of such speech; it needs a special knowledge to appreciate the significance of electro-magnetic induction. We write this with no intention of depreciating one man and exalting another; but to do something to remove a very widespread misapprehension.

We believe that in scientific circles in this country at any rate, Edison has had less than justice. His early inventions in multiplex telegraphy, such original work as he did in the phonograph, the loud-speaking telephone, the kinetoscope, and



Multiple and single-filament lamps and a three-way cable joint box shown by Edison at the Paris Exhibition of 1881
(From the ELECTRICAL REVIEW of November 5th, 1881)

latterly the nickel-iron storage battery, are sufficient to put him amongst the great inventors. In each of these he struck out an absolutely distinct line. In addition, in many directions he made important improvements on lines originated by others. But in every case, practical utility was his direct object.

Those Bugbears, the Mathematicians

Edison was never a mathematician. His researches in after years often involved elaborate calculations for which he had to depend upon associates whose labours never appealed much to him. "The greatest bugbears I had to contend with were the mathematicians. I found, after a while, that I could guess a good deal closer than they could figure."

He was fortunate, in that his earlier inventions provided him with the funds required for further experiment. In this respect his career is curiously parallel with that of Bessemer. Moreover, having the funds, he had the ability and enterprise to apply them.

Menlo Park, under his control, became a great inventions factory. Mass investigation was carried out there, in a way to which the world in those days was quite a stranger. To-day, every great industrial concern has its laboratory, with scientific men, sometimes numbering hundreds, systematically following up lines of research laid down for them. Half a century ago, Edison in this was a pioneer, and as such deserves the fullest recognition. Much of what was attempted led to nothing; that was inevitable. But much was accomplished; and what he did not do off his own bat so to speak — although what he did was in itself quite enough — was done with his initiation and under his direction.

Edison at the age of 34

Financial speculators used "Edison" as a catch-word; and popular journalism surrounded it with a mythology which time alone can remove. The flood lighting turned upon the man and his labours was not his doing. It is more than doubtful whether it was welcome to him. None of the legends which have gathered round his name appears to have had his own authority. In the interest of truth, in the interest of justice to one of the world's great men, we hope time will enable us to view him clearly and in true perspective, with his real greatness visible and beyond question. He himself made a modest enough claim, well expressed by the epigram which so fitted his personality, that "genius is one per cent. inspiration and ninety-nine per cent. perspiration." Of the genius which may be so expressed, Nature had given him a rare outfit.

A Long-lived Race

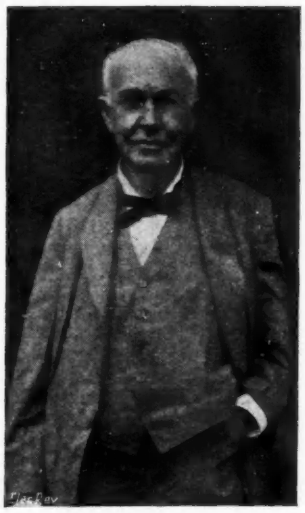
Great age seems to have been common among the Edisons: several of them lived over 100 years. The family crossed from Holland to America about 1730. After the revolution one of them, like many other loyalists, emigrated to Canada and died there at the age of 102. Following the revolt of Upper Canada (Ontario), the son of this Edison, Samuel, had to forfeit his property and recross the border into the States, finally establishing himself at Milan, Ohio, in 1842.

There Thomas Alva was born on February 11th, 1847, and there his first seven years were spent. The man who in later years became noted as one who could endure, apparently without fatigue, continuous and exacting hard work, was a rather frail boy hardly strong enough to attend school. He is described as a grave, old-fashioned child, who early manifested an observing and investigating mind. In 1854 the family of five moved to Port Huron, Saint Clair Co., Michigan, where Thomas attended school for three months. That was all the formal education he ever received; but his mother, resenting the notion that "Al was addled," herself undertook his instruction and guided his general reading.

His First Laboratory

Always ready to challenge and test assertions encountered in his reading, he was naturally an experimenter. In the cellar of his home he gathered the materials for his first laboratory. The need for money to buy more chemicals started him peddling garden produce grown by his father. Then he obtained a concession to act as newsboy on the Grand Trunk Railway, and the Civil War so stimulated his newspaper sales that he gave up his vegetable store. In 1862 (presumably April 8th—battle of Shiloh) the crowds in Detroit inspired young Thomas. He prevailed upon the telegraph operator to transmit the news all along the railway line, so that at each station at which the train stopped there was a rush for his papers——"then I realised that the telegraph was a great invention."

In the smokers' compartment on the train he kept not only his stock in trade and chemical paraphernalia, but actually a small printing plant whence issued a weekly news-sheet of his own. Constantly in touch with the railway telegraph, he was often able to chronicle local items that could not reach the regular Detroit journals until much later, if at all. To this travelling printing office mischance brought a disastrous fire; the train conductor lost his head and temper, and from his brutal blows is said to have resulted the deafness which afflicted the inventor throughout his life. Characteristically philosophical, Edison later on claimed it an advantage, protecting him from external distraction, and ultimately so directing his interests as to lead to the development of the carbon transmitter for the Bell telephone and the phonograph.



A recent photograph

Chancing to save the life of a station-agent's child which was playing on the track, Edison was instructed by the grateful father in train telegraphy, and at the age of sixteen he was a full-fledged operator.

In 1863 he produced his first invention. The operator was required to signal "6" hourly at night, as circumstantial evidence that he was awake. Devoting the greater part of his day to research, Edison felt the need of sleep, and devised a clock with a revolving notched wheel which automatically transmitted the requisite signals at the proper time. The story recalls the origin of the automatic working of the valves of the early steam engine.

The roving railway telegraph operator held positions in five of the Central States before he reached Indianapolis where he entered the employ of the Western Union Telegraph Co., his final job as telegraphist. In 1868 the Union alone had 3,219 offices, 50,183 miles of line, and 97,594 miles of wire; and on Edison's own authority, a great deal of it was old and sadly defective. Much of his leisure was spent in "monkeying with circuits and devising things to make the work of telegraphy less irksome."

Edison's First Patent

It was while he was thus employed as a telegraph operator that Edison took out his first patent, for a vote-recording machine designed to save time in Congress and other deliberative assemblies. It was perhaps his one invention which was not calculated to meet a public want. Time wasting, he soon found, was a valued parliamentary operation, and he returned from Washington a wiser man.

His next venture was a "stock-ticker," a forerunner of the modern tape machine. With this, and with a telegraph with an alphabetical dial, he left the service of the Western Union and went to New York. A lucky chance enabled him to show his ability to the company running the Laws "Gold Indicator," and he was put in charge of its plant.

Three months after his arrival in the capital, in October, 1869, an advertisement of Pope, Edison & Co., announced them as electrical engineers on Broadway; his partner, Pope, a telegraph engineer also associated with the Gold Indicator Company, subsequently became the editor of the American *Electrical Engineer*. Their business was ultimately acquired by the Western Union, who paid Edison $40,000 for his inventions.

The next move was to Newark, N.J., where he manufactured various electrical appliances including apparatus for the Automatic Telegraph Co., on whose behalf he paid his first visit to this country. His attention had already been attracted to multiple telegraphy, and the patents of the time show him to have been busy with duplex and quadruplex working. A few years at Newark revealed the fact that inventing, with the intensity which he applied to it, and manufacturing were incompatible; the factory was relinquished, and Newark was left in 1876 for Menlo Park, which he was to make famous for a continuous output of novelties and improvements. It was then as "The Wizard of Menlo Park" that he came to figure in the spotlight of sensational journalism.

Improvements in the Telephone

Here he established an experimental laboratory on a large scale, employing at times over a hundred assistants. The first sensational product was the phonograph, one of his most original pieces of work. Moreover, Bell had just made the first telephone, and Edison, alive to its possibilities, supplemented this with the carbon-button microphone and other devices, which greatly accelerated the practical adoption of telephony. His electromotograph, dating from this period, was one of the first loud speakers, although its principle was soon abandoned. The "tasimeter," in which minute differences in temperature were indicated by changes in the resistance of a carbon button under pressure, was another Menlo Park product.

The next few years were the most crowded in his career. Electricity was coming to be recognised as a new power which had been put into the hands of man; and such powers as Edison possessed in a unique degree were able to display themselves to the full. Remarkable among inventors, not only for the number of his inventions but for their wide variety, there was no side of the subject which he left untouched.

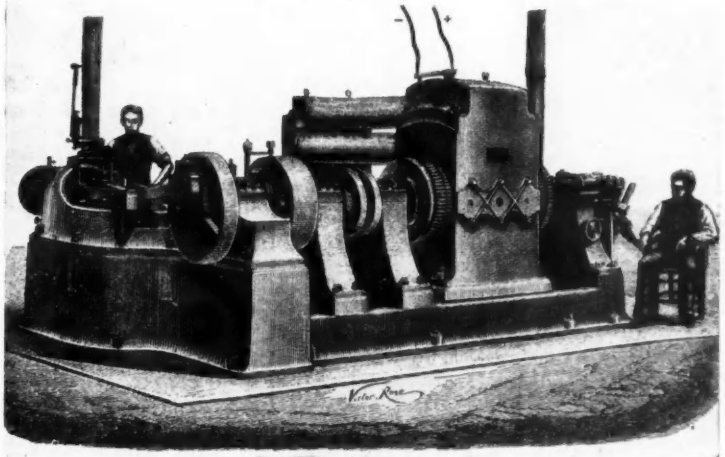
The Edison Dynamo

The dynamo, of course, attracted him. The use in the armature of substantial bars in the place of wires introduced difficulties in the way of connecting them up. Edison overcame these by threading upon the axle a number of discs, which were insulated from each other, the bars being attached to the discs by lugs. Improvements were made in the commutator, in which mica was employed as the insulator. In the general design Edison was not so happy, the early Edison dynamos being provided with field magnets of unusual length, which proved to be far from efficient; but when these had been modified by Dr. Hopkinson, the machine came into extensive use.

The Incandescent Lamp

The problem of the moment, however, was what was called the sub-division of the current, without which it could not be applied to domestic lighting. Joseph Wilson Swan, afterwards Sir Joseph, exhibited the first carbon incandescent lamp in 1878, after experiments which he had begun no fewer than forty years before. Edison worked at first with metal filaments, but these proved impracticable, and towards the end of 1879 he patented a lamp in which the filament was of carbonised paper, for which bamboo fibre was afterwards substituted. Swan shortly after this secured protection for a particular type of incandescent lamp; but, in view of the publication he had made a year before, made no general claims. The patent position, therefore, was a curious one.

The Swan and the Edison patents were handled at first by separate companies. If Swan's lamp of 1878, which was not protected, could be shown to forestall the subsequent patented lamps of both inventors, neither of these could form the subject of a master patent on all carbon filament lamps, such as, for the time being, both these companies contested. Instead of destroying each other's property, therefore, the two companies coalesced, the original Swan lamp was relegated to the background, and the Edison lamp, which was the first to be patented, was made the basis of far-reaching claims.



The large horizontal dynamo which formed part of Edison's Paris exhibit

The point at issue was whether the original Swan lamp, in which a carbon rod was enclosed in a vacuum, could be re-

garded as solving the problem of the incandescent lamp, or whether the finer bamboo thread constituted the invention. In the litigation, it fell to those against whom the Edison-Swan company took action, to emphasise the importance of Swan's work against the contention of the firm which bore his name. After a series of hotly contested legal battles, the Courts held that Edison's use of a "filament"—a term which then came into prominence in that connection—was a novelty which gave the Edison-Swan company what it claimed; and the development of the carbon filament lamp remained for many years in the hands of that corporation.

In the minor appliances connected with electric lighting a host of inventions emanated from Menlo Park. Fifty years ago, the pages of the ELECTRICAL REVIEW were constantly occupied with articles describing them, with details of his patent specifications, and with discussion and criticism. Fittings, switches, meters, were designed for use in business and domestic premises, the three-wire system was introduced, and much work done in improving distribution methods, particularly by means of underground cables.

The Edison Electric Illuminating Co. was formed in 1880 to construct the first central station in Pearl Street, New York. In 1922 Edison was formally presented by the Mayor of New York with a Key of the City, in recognition of what he did forty years before, in initiating a central station service.

The Paris Exhibition of 1881

The Paris Electrical Exhibition of 1881 was made the occasion of a remarkable exhibit of all the various Edison machines and appliances for lighting; and did a great deal to show on this side of the Atlantic what he had accomplished in America. So many and varied were the exhibits that a special extra issue of the ELECTRICAL REVIEW was necessary to do justice to them. Some of the illustrations from this issue are reproduced on the previous pages.

Electric traction was also occupying Edison then, and an experimental electric railway at Menlo Park was inaugurated in

Cable Address: "Edison, New York."

From the Laboratory
of
Thomas A. Edison,
Orange. N.J.

September 5th, 1922.

The ELECTRICAL REVIEW,
4, Ludgate Hill,
London, E.C.4,
England.

GENTLEMEN:

The years have passed so swiftly that it is difficult for me to realise that half-a-century has slipped by since your excellent publication came into existence. Yet I understand that in November next you will celebrate the completion of fifty years' continuous publication of the ELECTRICAL REVIEW. This is a notable event in the history of a publication devoted to electrical development, for a backward glance of fifty years in the art is somewhat akin to looking back to years of antiquity.

I think you are entitled to a pardonable pride in reviewing the growth of the ELECTRICAL REVIEW and the many years of great and useful service it has given to the electrical profession. So, allow me to extend my hearty congratulations on the approaching commemoration of your Jubilee, and also my best wishes for an ever-increasing sphere of usefulness in the field you have so ably occupied.

Yours very truly,

Thos A Edison

A letter congratulating the "Electrical Review" on reaching its Jubilee

May, 1880. The first Edison locomotive is now preserved in the Pratt Institute at Brooklyn. In the same year he secured protection for a magnetic ore-separator; and when the ore milling works in Sussex County, New Jersey, proved a commercial failure owing to the discovery of richer oil deposits elsewhere, the greater part of its mechanical equipment was applied to Portland cement manufacture. From this Edison was led to the design of buildings made by filling moulds with concrete.

By this time Edison, who had married G. Stilwell in 1873, was a widower; and in 1886 he made Mina M. Miller his wife. He had in all four sons and two daughters; and it will be remembered that one of his sons, Mr. Charles Edison, was in this country early this year in connection with the storage-battery litigation.

Menlo Park was left in 1887 and new laboratories were erected at West Orange, N.J., thereafter to form his headquarters for the remaining forty-four years of his life.

At that time celluloid was beginning to take the place of glass for photographic negatives; and Edison based on this his motion-picture camera, with the Kinetoscope as the viewing device. From this came the modern cinema.

The Edison storage cell was the outcome of experiments to find a substitute for the lead battery then in possession of the field. After modifying the Lalande cell, in which zinc and copper oxide were used with a solution of potassium hydrate as the electrolyte, Edison, in 1901, patented a cell in which the active material of the negative plate was finely divided iron, the positive being of nickel oxide with flake nickel or graphite to provide conductivity. The electrolyte was an alkaline solution of potassium and lithium hydroxides. This constituted a marked departure from the lead battery. Since 1908 the nickel oxide has been contained in perforated steel tubes and the negative active material in steel boxes clamped to a nickel-plated steel grid; and in this form the battery is now on the market.

Edison and Wireless

As long ago as 1883 Edison discovered that when a metal plate is suspended in a lamp-bulb, near the filament but insulated from it, and connected to the positive pole of a battery, a current would flow from the plate along the wire. This was known as "the Edison effect." Edison himself did not account for it; but thought it worth while to protect his discovery, and took out a patent in 1883 which was afterwards acquired by the Marconi Company. The patent specification illustrates a suggested means of wireless communication, and includes diagrams of receiving wires not unlike a present-day aerial.

Fleming was at the same time working on the same problem, and in 1839, having been appointed electrical adviser to the Marconi Company, developed a valve based on the Edison effect which was used extensively by the Marconi Company as a detector of wireless waves.

During the war, Edison became chairman and subsequently president of the "Naval Consulting Board of the United States," appointed to advise on the use of the manufacturing resources of the country. Later on, he took up a number of devices, mainly, but not exclusively, concerned with defence against submarine attacks. He is said to have remarked that the naval authorities "pigeon-holed every one of them."

Age and Honour

The pace, however, had long begun to lessen. Within recent years he has mainly been concerned with the maintenance of the various organisations which had come into being in connection with his many inventions. But he continued to watch the progress of the science with which so much of his early work was connected; and when in 1922 the ELECTRICAL REVIEW celebrated the Jubilee of its existence, a kindly letter sent us from Orange, which we reproduce on this page, told how recalling those days seemed to him like looking back to antiquity.

As we have indicated, popular recognition of his powers was never withheld, but early came to him in full share and running over. In later years, the scientific world manifested its recognition, and distinctions of various kinds showed a wider appreciation of them than had hitherto been manifested. Honours flowed upon him from many lands. He had been a Foreign Member of the Institution of Electrical Engineers in 1874, he became a Member in 1911, and in 1927 was made an Honorary Member. In October, 1928, he was presented by the United States Congress with a gold medal with the inscription "He illuminated the path of progress by his inventions." In the following year a celebration of "Light's Golden Jubilee" in the United States was, in effect, a national recognition of his work.

All who knew him bear witness to a most attractive personality. His deafness was never allowed to make him unsocial, and a sense of humour manifested itself in his conversation. He was extremely simple in his tastes, fond of children, and remarkably modest and free from egotism in spite of all the hero worship which was paid to him.

Such, in the briefest outline, was Edison's career as an inventor. We have named only the main headings. Many details under each heading had his attention, and received modifications and improvements at his hands. Some years ago it was announced that over a thousand patents bore his name. What the total is to-day we cannot say. Whatever it may be, it is a wonderful record, one which in these times of increasing specialisation is not likely to be reached again, much less surpassed.

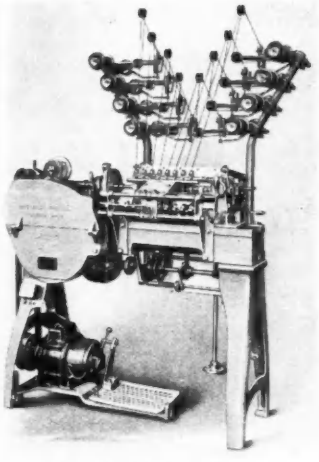
We may almost say of him, modifying Johnson's epitaph on Goldsmith, "He touched nothing that he did not improve." And how many and how varied were the things he touched!

Coil- and Textile-winding Machines

Some recent introductions of interest to the Electrical Industry

AMONG a wide range of new winding machines recently seen in operation at the Manchester establishment of the Universal Winding Co. (America) were some of electrical interest.

The No. 104 machine, shown in the first illustration, has been developed for the high-speed production of paper-insulated coils in multiple form, round or rectangular, bar or stick, up to 4 7/16 in. in diameter, and it separates the coils by a manually-operated slitting attachment. An outstanding feature is the paper-injecting mechanism which automatically inserts insulating paper between the layers of wire at high winding speeds, with gradually increasing lengths of the inserts, so as to ensure a uniform amount of overlap irrespective of the coil diameter. The machine will deal with paper thicknesses of from 0.0006 to 0.0035 in., from 2½ to 12 in. wide, and from 1⅛ to 15 in. long (individual inserts).

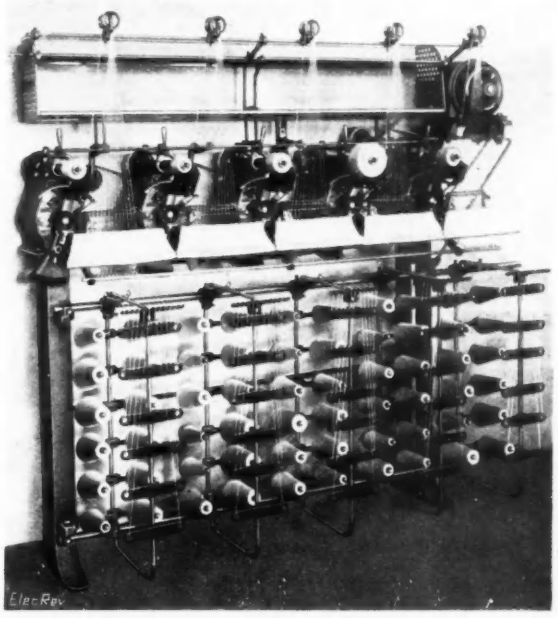


No. 104 Machine for Paper-insulated Coils

To overcome the disadvantage of separate cams for each different length of coil, an adjustable transverse mechanism is incorporated in the machine and can be set for any desired length of wire layer from 0 to 5 in. Wire breakage at starting is prevented by gradual acceleration of the winding arbor through a variable-speed motor, operated by a foot pedal. The number of turns to be wound is governed by a single-turn counter which can be set for up to 25,000 turns and will stop the arbor at any predetermined point. The driving unit is a ½-h.p. variable-speed single-phase motor, and the equipment also includes a control switch with overload protection, and an auxiliary switch to prevent rotation of the winding arbor until the main starting lever is in the correct position. The machine will work smoothly at 3,000 r.p.m.

Yarns of cotton, silk and other insulating materials, when intended for the covering or wrapping of electrical wire, require to be wound so as to form a suitable supply for the actual operation of wrapping the wire, and the company makes several precision machines for this form of winding. The No. 50 machine, in one form, is used to wind the yarn direct from spinners' cops or bobbins on to the package, the limit of the number of threads in this case being eight. The bobbins are mounted on holders fixed to the rod shown in the second illustration, and the yarn is taken upwards over a tension or drag board to the breakage detectors, which operate the stopping mechanism in the event of the failure of any of the threads. The various threads which are to be wound on to one package next pass over a roll mounted above the spindle, and are by this means collected together to form a compact tape of yarn which is next passed through a guide which preserves the tape formation, and by traversing rapidly to and fro lays the threads on the revolving package and builds up a firm compact "cheese," varying in length from 2 in. to 6 in., according to requirements. The No. 5-19 machine is also used for this type of winding, but it is of heavier construction, and has provision for winding up to ten threads on one package. The No. 14 or multi-multiple machine will wind in perfect tape form up to 48 threads, the supply being the multiple wound packages from the No. 50 machine; thus, for 48 threads, six packages, each containing eight threads from the No. 50 machine, would be put up on the No. 14 machine.

An alternative to the No. 14 machine is the No. 50, fitted with a cone creel. This combination will fold up to 24 threads in parallel form on one package. This system gives greater flexibility in operation, as any changes in yarn counts or numbers of threads to be used can be readily made.



Machine for Winding Yarn from Spinners' Cops (No. 50)

The Protection of Inventions

DURING the recent British Association meeting, the Department of Industrial Co-operation of the Economic Science and Statistics Section, discussed patents and the protection of scientific discovery.

Mr. A. G. Bloxam said that the patent agent, owing to the official search for novelty, had ceased to be the judge whether a patent application should be filed or not, and had had the duty thrust upon him of obtaining a patent for an invention verbally novel but devoid of subject-matter. The British Science Guild had recommended that the search should be made as soon as a provisional specification had been filed, but the Patent Committee had rejected the recommendation as impracticable. Mr. Bloxam did not admit impracticability. He suggested that a preliminary claim could be submitted with the provisional specification, but not as a part thereof, and could be subjected to the examiner's search. The search would then, if necessary, be conducted in two stages: the preliminary search on the preliminary claim, and a subsequent search on the claims submitted in any complete specification which might be filed in continuation of the application. By this procedure the applicant should receive the result of a search in time to prevent waste of effort and money in pursuing the invention; fewer futile applications would then be completed.

Mr. Hubert A. Gill, urging expedition in patent litigation, said that the present system of rewarding inventors by the grant of patent monopolies had led to abuses because litigation over patents was extremely slow and expensive. Various remedies had been proposed already, and another was the enlargement of the powers of the Comptroller to enable him to try patent cases. He also suggested that Counsel experienced in patent litigation might be appointed to the post of an official referee for trying minor actions, and that such a referee might be given powers different from those of the Courts, so that he might give rulings on the validity, scope, or infringement of a patent mainly on papers submitted to him.

Dr. H. S. Hatfield put forward suggestions for the revision of the Patent Law, which notoriously failed to secure to individual inventors a suitable reward; hence, they found it almost impossible to obtain financial backing. The law confused two quite separate desirable aims: (1) the reward of the actual inventor and his backers in the developmental stage; (2) the encouragement by limited monopoly of new manufactures. The remedy was to separate the two issues. The inventor should only be required to register his priority by an account of what he was doing, and should not receive a grant of monopoly. This should go to a manufacturer on application, with production of evidence of bona fides, and be secured to him absolutely during continuance of manufacture and general good behaviour, due advertisement having given objectors a limited period in which to appear. The monopoly would normally carry with it a fixed percentage charge, to be divided among claimants having had shares in the invention and development to practicality of the new manufacture. Claims would be decided by a Commission, which would also deal with cases in which inventions were being manufactured without application for monopoly having been made.

The Situation in Australia

FROM OUR SPECIAL CORRESPONDENT

IT is a commonplace remark to-day in Australia that the only individuals "doing well" are professional accountants who specialise in bankruptcies, liquidations, assignments of estates, and similar unhappy sequels to enterprise. One certainly feels at times, when looking through doubtful new prospectuses, that future time and bother would be avoided if the name and address of the liquidator were published with those of the officials of the company!

Be this as it may, every form of industry and commerce in Australia is passing through stormy times and being tested as never before.

Speaking generally, it is now realised by all concerned that, during many prosperous years, the epigram alleging that the country is "carried on the sheep's back" very fairly expressed the position, and that to-day the animal's back, if not broken, is badly strained.

A drop of over 50 per cent. in the value of the wool clip and the wheat crop and a sudden dam in the hitherto constant stream of loan moneys of necessity forced all to realise that "good times" had temporarily ceased and that Australia was in a morass from which she would not be definitely and finally extricated until she could export, at a profit, on a scale to balance her imports, now about 54 per cent. below "normal," and cover her overseas interest obligations.

An Altered Outlook

More important than the changed outlook of most political leaders is the attitude of the workers. They now see what they did not always see during the high-wool-price era, that while the country can provide a fair standard of living, that standard must be earned; that overseas loans cannot be depended upon to make up deficiencies in income; and that any shortage must be made good by increasing Australian production or by decreasing expenditure. Public apathy in the past must bear its share of blame for faulty legislative policies, but it is certain that the change in opinion has had its effect upon the more extreme politicians, or the majority of them. Reductions in salaries, wages, pensions, etc., hitherto inviolable, have been made.

In the meantime, other steps taken to relieve the position, such as the internal loan conversion scheme, are in the right direction even if, of themselves, insufficient to turn the scale.

The delay in realising the gravity of the position, in taking remedial measures, and what may be termed bad Australian publicity led overseas critics to infer that Australia was doing too little to extricate herself from her predicament. Such an impression to-day would be an erroneous one, however true it might have been a year or so ago. The whole of the financial, industrial and commercial world, and most of the politicians, have long appreciated that this is no ordinary depression but a crisis, possibly catastrophic, and one requiring a complete and stern readjustment of values and ideas. With one important exception the Commonwealth is bent on a restoration of confidence and a reduction of unemployment.

Position of the Electrical Industry

Having briefly examined the general and political position, let us see how the electrical industry in Australia is faring during these arduous times. The Australian electrical world is having its full measure of tribulation. All branches are affected, to a greater or less extent. The consulting engineer has few or no jobs in hand; the manufacturer is forced to curtail production and to examine his costs as never before; the trader's prospects of outlets for his merchandise, accompanied by a prospect of being paid in a reasonable time, become increasingly scarce; while the supply stations report falling loads, both for lighting and power. To these we must add the effect of heavy and increasing taxation, harassing regulations, and the difficulty of remitting even when willing to pay the high exchange.

As an indication of the disturbance let me quote from the report of the Metropolitan Water Board (Sydney) for the year ended 30th June, 1931, regarding building operations in the metropolitan area. It is shown that during the period mentioned 3,096 new buildings were erected, costing £4,117,799; the corresponding figures for the previous year were 11,316 and £17,556,257. The effect upon the demand for lamps, cable, accessories and domestic appliances is readily apparent, without quoting other results. The figures for the current year are expected to be worse. The data quoted is more or less typical of that obtaining for the other capital cities of the Commonwealth, but Sydney makes the worst showing.

In recent weeks new connections to the supply systems have shown a serious drop, and they are estimated at only 15 per cent. of those for corresponding weeks a couple of years ago. Many supply authorities have postponed or abandoned plant extension programmes and, in at least one instance, a contract placed has been cancelled by arrangement.

So much for the black side of the picture—what of the future?

The Problem Facing British Firms

Is it worth while for British firms who for many years have maintained Australian branches, to continue to do so in the hope of better conditions in the near future? Shall we hang on, in patience and with confidence, with economised staffs and reduced overhead expenditure, until an improvement arrives, or shall we close down and, by retiring from the field, make things better for those who remain?

The problem is one for serious consideration by the responsible managements; each case must be weighed on its merits, and regard must be paid to the need for maintaining all possible trade outlets during the industrial depression "at home."

In some instances, it may be found that, by reason of the great expansion of local manufacture in Australia, the selling branch of a British manufacturer is doomed to close down. The alternative of starting new factories is not, in general terms, to be advised. There are exceptions, but, broadly, the further establishments of Australian factories is not to be recommended for some time to come. Local electrical manufacturing is already in excess of requirements; for certain descriptions it is in excess of the demand even for "boom" times, and it will be a case of the survival of the fittest. The Australian electrical manufacturer does not find a high tariff an unmixed blessing. Encouraged by the tariff, new factories came into being beyond the capacity of the market. Encouraged, too, by the tariff are the trade unions who clamour to the Arbitration Courts for a share of the spoils. Whilst instancing in particular the Australian iron and steel industry, the following comment of Erlangers is legitimately applicable, in part, to Australian electrical manufacture:—

> The keystone to the arch of success in her endeavour will not be placed in position until she can prove to the world that her iron and steel industry is established on a sound basis and can supply the wants of the country at a reasonable price without the constant help of ever-advancing protective tariff rates.

It should be mentioned that, so far as certain departments of Australian electrical manufacturing are concerned, the position is not one of "ever-advancing tariffs" but absolute prohibition of imports.

In those cases where local manufacturing is unlikely, it is necessary to explore every possibility and to examine all figures very closely before reaching a decision one way or the other—to carry on and, by so doing, in some measure assist in the restoration of confidence so badly needed; to carry on, of course, with due regard to economy, or to close down and make a clean cut of the problem. If it is thought that a total cessation of activities for the time being with a possible later re-entry be the solution of the difficulty, it must be recognised that certain classes of customers may, in the future, continue to give support to those firms who maintain operations.

Australia's Inherent Strength

When writing of Australia it is almost part of the ritual to mention the primary industries and the "wonderful potentialities" of the country, but it is the fact that both these must come under notice.

Every argument rests upon the unalterable basis that, for many years to come, Australia's prosperity depends upon the production and marketing at competitive prices of her wool, wheat, fruit, dairy and other primary products, and complete realisation of the point that the country cannot indefinitely make levies on her own people to enable her to export. The artificial assistance to the secondary industries has increased the burden, almost beyond endurance, on the primary producer, forced to sell his own products at world parity. The efforts of the banks and other financial institutions are devoted mainly to the aid of the "man on the land." City residents know that there must be sacrifice to help the country producer.

As to the "wonderful potentialities," until recently the enthusiasm of the Australian for his country was naturally and rightly apparent, but there is now a distinct tendency to examine the whole structure more critically, especially in the economic sense. One prominent Sydney journal now suggests that Australia, after all, may be but a very ordinary country. This is to be regretted, for there can be little real doubt that, while not endorsing the wildly exaggerated claims of the ultra-enthusiast, Australia has a great and assured future, and she is certain to rise superior to her present economic troubles as well as to her drought and flood disabilities.

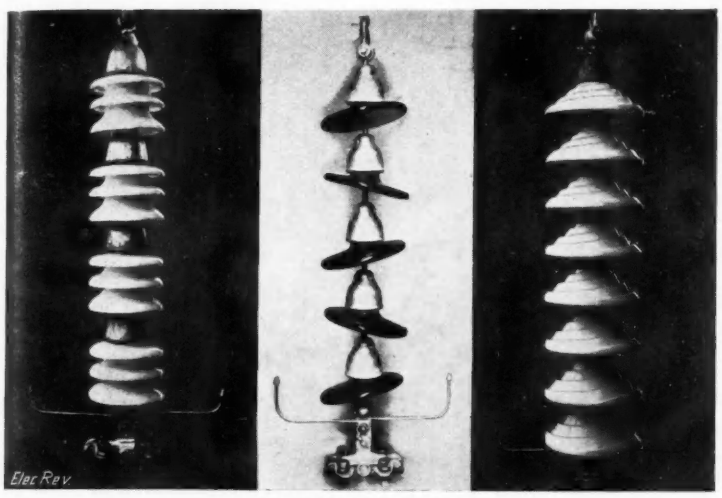
With no "five year plan" disturbances, but a return to reasonable conditions throughout the world, it is certain that we shall find Australia and Australian trade looming largely again. The more optimistic already discern signs of improvement in some parts of the country.

Overhead-line Exhibits

Fourth annual conversazione of the O.L.A.

THE Overhead Lines Association held its conversazione and supper-dance at Harrods' Georgian Restaurant, Knightsbridge, on Friday evening last week, this being the fourth of the annual series. Mr. W. C. Bexon (president) and Mrs. Bexon received members and their guests, who numbered about 230, and dancing was kept up to well after midnight. During the supper interval the new president, Mr. R. J. Jocelyn Swan, paid Mr. G. W. Molle, hon. secretary, a well-deserved compliment on the excellence of the arrangements. Mr. W. Fennell is to continue hon. treasurer.

The principal guests included Mr. C. C. Paterson (president of the I.E.E.) and Mrs. Paterson, Miss C. Haslett, Mr. and Mrs. H. W. Grimmitt, Mr. and Mrs. W. R. Rawlings, Mr. and Mrs. H. Nimmo, and Mr. and Mrs. P. F. Rowell.



Steatite Anti-dirt Insulators

A large collection of exhibits relating to overhead-line practice was on view.

Steatite & Porcelain Products, Ltd., showed special designs of anti-dirt insulators, as illustrated above. It will be noticed that the disks of one string are inclined and that in another type a spiral groove is formed to allow rain to wash off easily, while the ribs have been omitted from the standard type.

Bullers, Ltd., exhibited metal-hooded, Hewlett, shackle, leading-in, and pin-type insulators, also a patent cone-grip clamp for steel-cored aluminium conductors, the chief characteristic of which is that it can be assembled without difficulty to effect readjustments in the sag of the conductor if necessary.

Electric Transmission, Ltd., had a comprehensive exhibit of such insulator and hardware designs as are generally installed on an overhead system between sub-stations. The bird guards exhibited were, in fact, specially shaped line insulators. A new roller-type suspension clamp was shown in its initial stages, by which appreciable saving in erection costs is obtained.

The outdoor switchgear and fuses shown were light in weight and the fuse-gear is so designed that when the fuse blows it acts as an indicator.

The Yorkshire Switchgear & Engineering Co., Ltd., had on view combined end-strains and service fuses of different patterns for voltages up to 750, and for current up to 100 amperes as illustrated herewith. The company also exhibited its patent end-dividing box for terminating a cable up a pole and thence to overhead distributors. This box is novel in many respects and embraces fuse or link gear so that the line can be disconnected from the cable rapidly.

Messrs. Ferguson, Pailin, Ltd., exhibited an indoor, oil-immersed plug fuse; an outdoor oil-immersed plug fuse; detail parts of a plug-fuse showing construction; and an isolating switch, type S.T.O.

Messrs. J. G. Statter & Co., Ltd., showed an ironclad distribution board fitted with miniature circuit breakers in place of the usual fuses; and a s.p. all-insulated miniature circuit breaker of a new type, which they have recently commenced manufacturing.

Messrs. Griffiths Bros. & Co. (London), Ltd., had a display of "Ferrodor" ore and anti-corrosive paint, and the Zinc Alloy Rust-proofing Co., Ltd., indicated some of the various applications of the "Sherardizing" process for the protection of fittings.

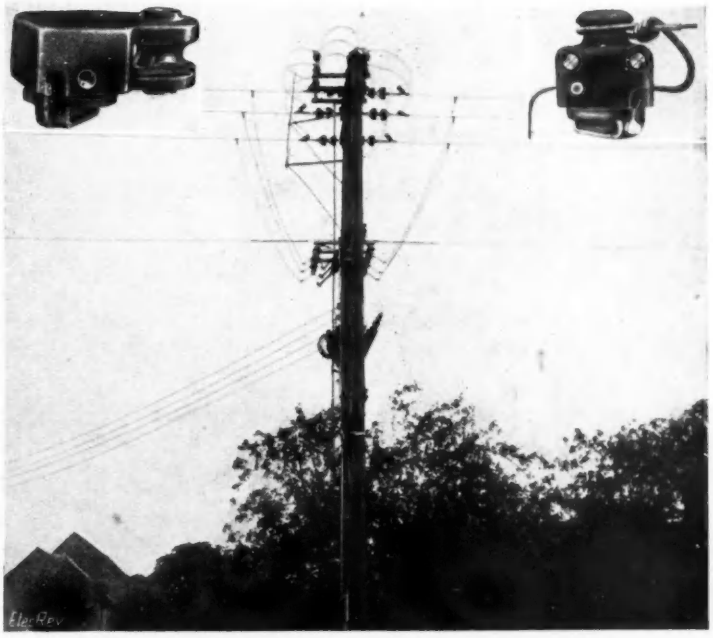
On Messrs. Thomas Bolton & Sons' stand a selection of conductors was on view. Sub-station cellular conductors are built up of hollow wires, or of solid copper round hollow brass wires. For long spans, conductors are made of bronze surrounding cadmium-copper; segmental copper conductors were also shown.

Messrs. Evershed & Vignoles, Ltd., demonstrated applications of "Megger" and "Meg" earth testing instruments. The Croydon Cable Works, Ltd., indicated the numerous uses to which "Pernax" insulation can be put, and Messrs. James A. Jobling & Co., Ltd., showed a selection of different sizes and types of "Pyrex" glass insulators for overhead power lines and wireless purposes. The Better Lines Co.'s collection of fittings included a roller clamp designed to achieve better handling of all classes of conductors in the field. Other exhibits were house-service fittings to meet the infinite variation of the angle at which service lines leave the main distributor and approach the house.

Court Works, Ltd., exhibited a range of galvanised, malleable iron clamp bodies, bridges, clevis links, socket links, snail clamps, flanges, insulator bells, and other castings.

The Electrical Equipment & Carbon Co., Ltd., showed a cone tube and nut binder for joining two lines in tension, the "Maxim" line clamp and the "K.P." draw tongs; also aluminium clamps which have recently been produced and high-tensile steel conductors manufactured by Bruntons (Musselburgh), Ltd., for whom the company acts as agent.

Drake & Gorham Wholesale, Ltd., exhibited a range of safety earthing switches, incorporating trip mechanism operated by a coil inserted in series with the usual earth wire, which responds to a fault potential on the protected apparatus of only 20 V, even with a resistance to earth of 500 ohms or more. The current required is only 15 to 20 mA, and fatal shock is rendered practically impossible. Application is not limited to new installations, as types are made to suit existing wiring with no earthing previous to their use, and local control of apparatus in bathrooms and kitchens is also possible without earthing the whole system; this switch is made from 6 up to 350 amperes in capacity.



Yorkshire Pole with Combined End-strains and Service Fuses

Venner Time Switches, Ltd., had a display of stop watches, automatic switches of a variety of types, and prepayment meter attachments. Mr. F. J. Down showed fuse-switches, several types of anchors, clamps, "slack pullers," an earth auger, spring hammer for making holes in concrete and stone, a strainometer, etc. Models of transmission-line poles were lent by the North Metropolitan Electric Power Supply Co., and literature was displayed by the Electrical Association for Women and the Electrical Trades Benevolent Institution.

Electric Clocks. By Stuart F. Philpott, A.M.I.E.E.

A consideration of the relative advantages of the various types available

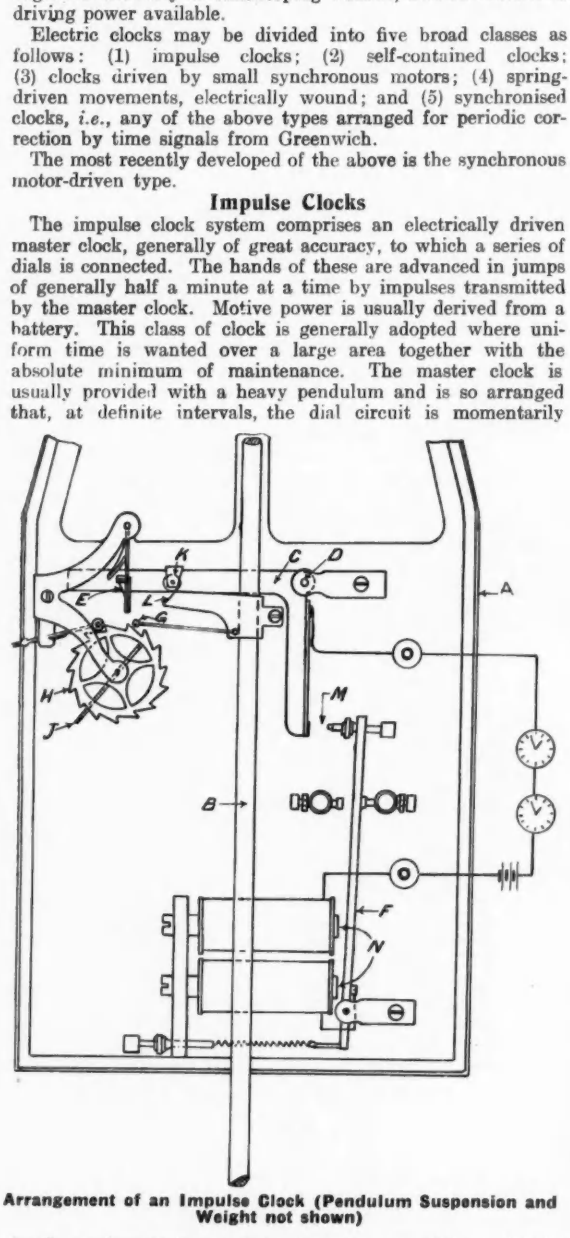
MODERN electric clocks are well designed and built; their prices compare favourably with those of the spring-driven type and they are generally more accurate. Their development has proceeded along various lines dependent on the use to which the clock is to be put, the degree of accuracy of timekeeping wanted, and the source of driving power available.

Electric clocks may be divided into five broad classes as follows: (1) impulse clocks; (2) self-contained clocks; (3) clocks driven by small synchronous motors; (4) spring-driven movements, electrically wound; and (5) synchronised clocks, *i.e.*, any of the above types arranged for periodic correction by time signals from Greenwich.

The most recently developed of the above is the synchronous motor-driven type.

Impulse Clocks

The impulse clock system comprises an electrically driven master clock, generally of great accuracy, to which a series of dials is connected. The hands of these are advanced in jumps of generally half a minute at a time by impulses transmitted by the master clock. Motive power is usually derived from a battery. This class of clock is generally adopted where uniform time is wanted over a large area together with the absolute minimum of maintenance. The master clock is usually provided with a heavy pendulum and is so arranged that, at definite intervals, the dial circuit is momentarily



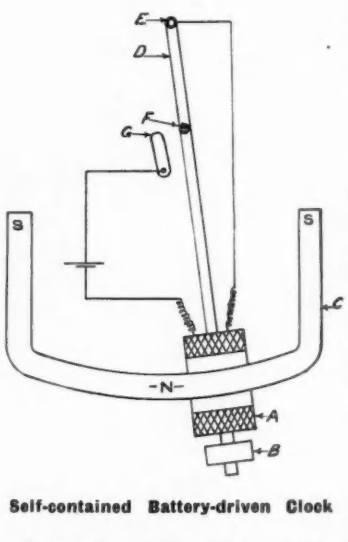
Arrangement of an Impulse Clock (Pendulum Suspension and Weight not shown)

closed, causing all the clock hands to be moved forward half a minute; at the same time the pendulum is given a gentle impulse to keep it in motion.

The chief problems in the design of these clocks, bearing in mind that accuracy of timekeeping is of prime importance, have been to leave the pendulum untrammelled by the operation of trains of gears and also to give its driving impulse in as gentle manner as possible at the centre of the swing, in order not to interfere with its natural arc. Much ingenuity has been shown in this respect, and at least one firm, the Synchronome Company of London, has succeeded in producing a master clock having no wheels at all—the only work which the pendulum is called upon to do being to operate a small switch by the action of a permanent magnet once per stroke.

There are several systems of impulse clocks in this country, but as it is not possible to describe all these in a short article, the Synchronome has been selected as typical. The principle of the master clock (the more familiar form, and not the "super" type mentioned above, which is a fairly recent development) is shown in the first diagram.

A is the baseplate of cast iron, and B the pendulum rod of "invar," a metal having a negligible coefficient of expansion, suitably supported, to which is attached the pendulum bob; the latter is not shown in the illustration.



Self-contained Battery-driven Clock

The switch motion comprises two parts (1) the right-angled lever C, called the gravity arm pivoted at D, and normally resting with its longer arm on catch E; (2) the armature F pivoted at its lower end. The pendulum carries a small hook, or gathering jewel G which engages with the ratchet wheel H, drawing it forward one tooth every complete swing, *i.e.*, every two seconds. The wheel has 15 teeth and therefore makes one revolution in half a minute.

Attached to this wheel is a vane J so arranged that once in every revolution it pushes catch E aside, letting gravity arm C fall. The roller K on the gravity arm runs down the face of the curved end of the pallet L, giving the pendulum its impulse, and contact is made with armature F at M.

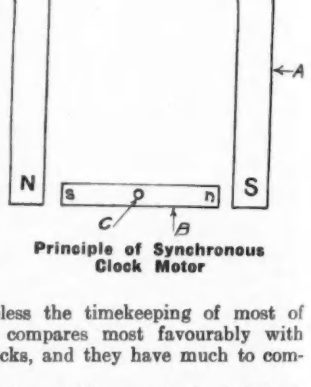
This completes the circuit through the dials, advancing the hands one half-minute; at the same time the magnet N attracts armature F, replacing it on the catch E ready for the next cycle of operations.

The clocks are operated by primary batteries. The dial movement consists essentially of a ratchet wheel, having 120 teeth, directly connected to the minute hand. Each impulse from the master clock causes the ratchet to advance one tooth. The hour hand is, of course, driven by a train of gears having a 12 to 1 reduction.

In addition to ordinary clock dials, it is possible to incorporate many refinements such as programme controllers for the automatic sounding of works hooters and the like, chiming gears, &c.

Self-contained Clocks

As the name implies the driving battery in the class of self-contained clocks is contained in the case itself, and its portability and the absence of external wires make it a popular domestic type. Current is usually derived from a 1½-V dry cell, the life of which is anything from two to three years. The current consumption is infinitesimal — being usually of the order of .002 to .003 amp. at the contact moment. Most clocks of this type are directly opposed to strict horological principles in their construction, in that the pendulum is made to drive the clockwork instead of merely to control its rate. As explained in the section on impulse clocks, one of the main principles of accurate timekeeping is to leave the pendulum as free as possible. Nevertheless the timekeeping of most of these self-contained clocks compares most favourably with that of high-class spring clocks, and they have much to commend them.

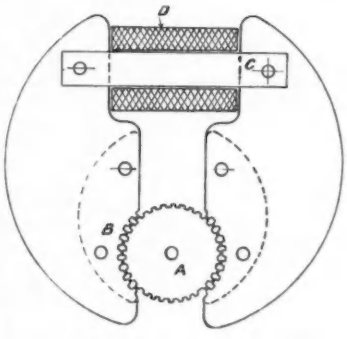


Principle of Synchronous Clock Motor

One of the best-known clocks of this type is the "Bulle," whose principle of working is briefly as follows. Referring to the figure at the top of this column, A is a solenoid which with the adjustable weight B constitutes the pendulum bob and swings over permanent magnet C. D is the pendulum which,

swinging to the left, makes momentary contact with plate G. It thus completes the circuit through the electro-magnet and causes the pendulum to be repelled from the middle pole of the magnet, giving it an impulse to the left.

One of the features of this particular clock is the consequent pole magnet which is said considerably to increase the efficiency of the electro-magnet owing to the more favourable position of the lines of force compared with the moving coil. The mechanism is ingeniously arranged so that contact with G is not made on the return journey of the pendulum. The drive for the clock hands is taken through suitable gearing from the to and fro motion of the plate (not shown) to which contact plate G is secured. The actual clock mechanism of course includes many refinements not mentioned here.



Diagrammatic View of Synchronous Clock Motor

Synchronous Clocks

Synchronous clocks constitute one of the latest developments in electrical time-keeping and are directly due to the Grid scheme in this country.

Synchronous clocks are entirely different from any other class of electrical time-keeper and depend for their accuracy on the frequency of the supply mains, which in modern power stations, on account of the necessity of inter-working, is kept within very fine limits of the declared periodicity. As its name implies, the driving member of the synchronous clock is a tiny synchronous motor which keeps absolutely in step with the supply frequency. Gearing is provided to reduce the rotor speed to the one revolution per hour and one revolution in twelve hours required by the minute and hour hands respectively.

The performance of this type of clock on a controlled frequency is remarkable. The writer has checked one against the B.B.C. time signals for some time past and it has shown a consistent weekly error of four seconds (gain) only, a performance which it is difficult to equal with the most expensive spring clock. The energy consumption is only about two watt-hours per hour.

This type of clock has certain disadvantages, of course, in that it has to be permanently wired to the mains, and if the supply fails the clock stops, either for the duration of the fault or altogether, depending on the construction, some being self-starting and others not so. The self-starting type has the disadvantage that, if the supply fails for a short period of say, five minutes, the clock will be slow by that amount and the error may not be noticed.

The principle of the synchronous motor is very simple. Referring to the figure on the previous page, A is a permanent magnet having poles N and S, B is a piece of steel pivoted at C. Poles N and S are induced in B and if the permanent magnet is rotated round the centre C, B will follow it and rotate at the same speed as the magnet.

Now if B, instead of being permanently magnetised, were arranged to be magnetised by alternating current the same conditions as regards change of polarity would obtain as if it were mechanically rotated. The left hand pole would be N polarity at one instant and S polarity the next, and if B were given a start it would follow the changes of the polarity of the magnet and keep in step with the alternations in the supply current.

The rate of rotation would of course depend on the frequency of the supply and the number of poles of the magnet. The formula is r.p.m. $= 2 \times$ frequency $\times 60$/poles, thus the two-pole rotor and stator shown would rotate at 3,000 r.p.m. on a 50-cycle supply.

The application of this principle to the clocks of the Telephone Manufacturing Company is shown in the diagram above, where A is the rotor consisting of a steel disc having a number of teeth on its periphery. The stator comprises two pole pieces made up of several laminated steel plates, the shoes being notched to correspond with the rotor teeth. The two pole pieces are joined by a laminated core C on which is mounted the exciting coil D. A small flywheel, not shown, is mounted on the rotor spindle to maintain the momentum.

By the formula previously given, the rotor revolves 187.5 times per minute. This is reduced to drive the hands of the clock by oil-immersed gearing, special precaution being taken to ensure silent running. Some clocks have a smaller rotor and a correspondingly higher speed, but the slower rotor speed is to be preferred as likely to wear less rapidly.

Frequency Control

In view of the fact that the synchronous type of clock is absolutely dependent upon correctness of frequency for its accuracy, a description of the means employed in large power stations for frequency control may not be out of place here.

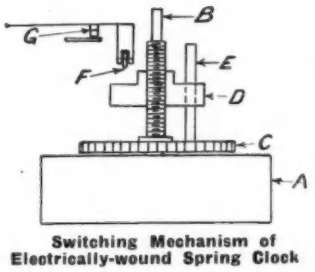
A popular type of master frequency meter is the Warren, capable of giving an accuracy of 1/500th of 1 per cent. In its essentials it consists of two clocks, one a very high grade pendulum clock, the other a synchronous clock running off the supply mains which it is desired to control. The main control dial has two pointers—one red and the other black. The black pointer is connected to the pendulum clock and makes one revolution every five minutes. The red pointer is driven at a similar rate by the synchronous clock; thus if the frequency is correct the two pointers will rotate together. Any slight deviation from standard frequency is immediately apparent to the switchboard attendant, by the red pointer leading or falling behind the other, and steps can be taken to alter the generator speed to bring them together again.

Electrically-wound Clocks

Electrically-wound clocks are spring-operated clocks arranged for periodic winding by electrical means—energy being derived either from a battery or from the mains. They are generally used in cases where a pendulum could not be successfully used, and where the clock must be kept going in the event of a failure of the electricity supply. Common uses of this type of clock are for time switches operating street lamps, motor car clocks, and the pendulum clocks of master frequency meters discussed in the last paragraph.

The amount of reserve carried in the driving spring depends on the make and use, and varies from a week to one minute. The most usual form of wind consists of a vibrating armature which winds the main spring by a form of ratchet action. When the spring is wound to a predetermined point the power is cut off, and, similarly, when the spring has unwound to a given point the winding mechanism is switched on again.

A typical form of this control is that employed in the Venner electrically wound time switches shown diagrammatically in the last figure on this page. A is the spring casing, B is the spindle by which the spring is wound, and C the gear wheel from which energy is transmitted from the spring to the clockwork. On B is put a screw thread and on it is a nut D, prevented from rotating by the guide pin E fixed to wheel C. When the spring is wound, nut D slowly rises on B eventually coming into contact with roller F, opening the switch contacts G, and so stopping the winding motor. As the spring unwinds again D is carried round with wheel C on the now stationary spindle B and therefore travels downwards until the contacts G again close, allowing the cycles to be repeated.



Switching Mechanism of Electrically-wound Spring Clock

Synchronised Clocks

Synchronised clocks comprise any class of clock, electrically or spring driven, arranged to be automatically corrected at intervals by time signals transmitted from Greenwich Observatory. They are not used to any great extent to-day owing to facilities available for checking time by wireless and by the high degree of accuracy obtainable with the master clocks of the impulse system.

Their development has been to some extent accelerated, due to a by-law of the City of London by which all public clocks are required to be kept synchronised with Greenwich mean time by means of a wire from the Post Office, or other approved method.

One method of working is to give the clock a permanent gaining rate of some fifteen seconds per hour stopping it when the minute hand reaches the hour and restarting the clock by the transmitted time signals. Another method used is to arrange for an electro-magnet, operated by the incoming time signal, to force a V-shaped wedge into a slot in the minute hand motion so as to bring the pointer dead to zero. The cost of special lines to connect with Greenwich during the period of the time signal is prohibitive except in very special circumstances.

Decorative Lighting

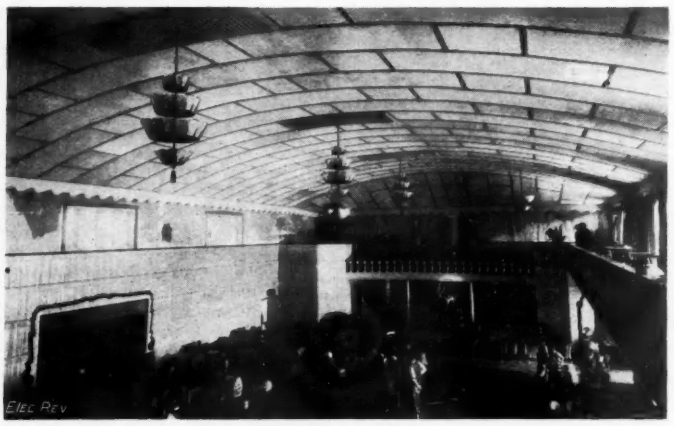
An Attractive Scheme at West Park Pavilion, Jersey

THE new dance pavilion at West Park, Jersey, which is of South African Dutch design and overlooks the bay of St. Aubin, differs somewhat from the usual type of seaside pavilion in that it has no domes or towering minarets. It is situated on the outskirts of the town of St. Helier, adjacent to the People's Park and Mont Patibulaire, and harmonises well with its surroundings. The main hall is 109 ft. long by some 59 ft. wide and is constructed without supporting pillars. The decoration scheme is attractive and of unique character. The walls are finished grey with an introduction of silvering simulating a falling-water effect, this innovation reflecting a large amount of credit on the architect and decorative artists. The whole of the front of the building is fitted with sliding glass doors which open out on to the sun promenade.

The illumination scheme is the most attractive of all the features of this novel building, for the special lighting arrangements which have been put into service provide forceful examples of the most modern methods of illumination. The two strikingly designed lighting fittings at the entrance to the pavilion provide a brilliant flood of light. On both sides of the entrance to the booking office floodlighting units are installed in concealed positions to emphasise the architectural features. The booking office vestibule is illuminated by choicely designed fittings equipped with orange colour-sprayed lamps, the resultant effect being a rich golden light. A unique lighting feature is a newel post flower vase in which is concealed a powerful reflector of unique design which at night provides an even distribution of illumination over the area of the stairs, and lights up the flowers in the vase.

The illumination of the main hall is carried out by a number of elaborately designed metal and raindrop glass tier fittings in which are installed pearl and colour-sprayed lamps on different circuits, each of which is separately controlled by dimmers, enabling colour-lighting changes to be introduced. The three larger fittings are of 4-tier construction, the diameter of the larger tier being some 5 ft.

The bandstand recess is illuminated by acting-area floodlights, while a number of horizon floods are used to obtain lighting effects of a pleasing character on a silvered curtain. These are dimmer controlled and the effects obtainable are very attractive. The stage is fitted with separately controlled floodlights and battens which permit of every form of light gradation being introduced. The whole of the lighting of this dance hall has been arranged in order that it may be used as requirements dictate, namely, for the staging of cabarets, concert parties or theatrical productions, &c.



The West Park Pavilion, Jersey

There is a large anteroom arranged as an annexe to the gallery overlooking the large hall, and here again many novel lighting effects have been introduced by the use of star fittings in both pendant and wall-type varieties. The columns at the entrance to this apartment are floodlighted by means of recessed units employing 60-watt "Striplite" lamps and reflectors, this lighting innovation proving remarkably attractive especially when combined with the lighting of the main hall as viewed from the dance floor.

The lighting of the outside terraces has been arranged along subdued lines, the scheme blending admirably with the general lighting conditions of the building. The refreshment rooms are decorated in nautical manner, and here the lighting is continued by means of several specially designed types of ships' lanterns, these providing high-intensity illumination throughout.

Mr. Roy C. Blampied, A.R.I.B.A., was the architect responsible for the design and decoration of the structure, and the illumination scheme was drawn up by him in conjunction with the Jersey Electricity Co., Ltd., which was responsible for carrying out the installation, the General Electric Co., Ltd., having supplied the whole of the fittings and necessary apparatus.

London and Home Counties' Supply in 1930-31

THE Report of the Proceedings of the London and Home Counties Joint Electricity Authority for the year ended March 31st, 1931, amplifies the forecast of some of its principal features given in our issue of May 22nd (p. 882).

The J.E.A., which represents both local authority and company undertakings, and also other interests such as the railways, is an actual distributor over an area of 130 sq. miles. In the Thames Valley it holds the Orders for Surbiton, Twickenham, Hampton, Teddington, Ham, Hampton Wick and District, and Weybridge. The Twickenham and Teddington and the Surbiton undertakings were acquired last January, and the Weybridge undertaking last July.

In Mid-Surrey, the Authority has acquired the Dorking, Reigate rural, Leatherhead, Epsom rural, and Guildford rural undertakings. It has also extended its boundaries in this area, and has under consideration the giving of supplies in the part of Reigate rural district not hitherto served.

In all the five distribution areas an important subject of negotiations has been the exercise of purchase rights over electricity undertakings, and the administration of the electricity services as a whole under an approved scheme.

For the purpose of administering the undertakings acquired, the Authority formed a standing committee, which works in close co-operation with the local Joint Advisory Committees established by the Authority. Upon the recommendations of these committees the Authority has given effect to the following proposals:—(*a*) A reduction in the flat-rate charges for electricity of from 12½ to 33⅓ per cent.; (*b*) the introduction throughout all the undertakings acquired of a uniform two-part tariff for domestic purposes, based upon the recommendations of the committee appointed by the Electricity Commissioners in 1929 to report upon the question of uniformity of tariffs; (*c*) the introduction of two-part tariffs for supplies other than domestic supplies; (*d*) the introduction of a uniform charge over and above the flat-rate charge in respect of supplies through prepayment meters: (*e*) a uniform charge for meter rents and service connections; (*f*) the introduction of a scheme for the hire and hire-purchase of wiring installations and electrical equipment; and (*g*) the extension of distributing mains, erection of offices, showrooms, etc.

Agreements have been completed or are in course of negotiation between the J.E.A., acting in close co-operation with the Central Electricity Board, and certain undertakings, under which the generating stations owned by the latter are to be operated in accordance with the requirements of the J.E.A. All electricity generated is taken by the Authority, which supplies the electricity required by the undertakings on terms agreed between the J.E.A. and the C.E.B.

The undertakings referred to are as follows:—Barnes, Epsom, Finchley, Hammersmith, Hornsey, Islington, Kingston-upon-Thames, Leatherhead, Reigate, and Woking.

Bulk supplies are also being given to the Walton-upon-Thames U.D.C., and terms have been arranged for a similar supply to the Richmond (Surrey) Electric Light and Power Co., Ltd. Approximately 42 million kWh was sold in bulk during the year under review.

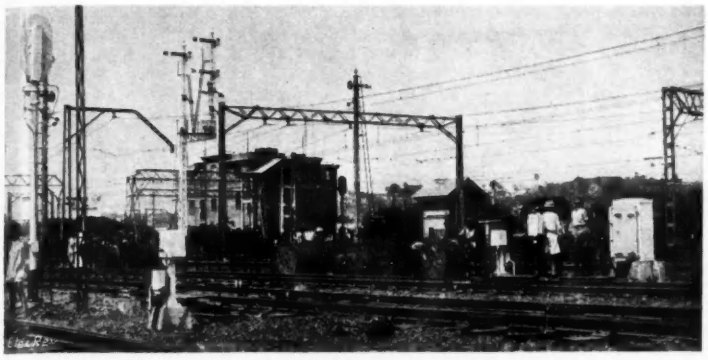
In virtue of its powers to enter into contracts on behalf of undertakings, the Authority has made an agreement for the supply of fuel oil on advantageous terms for the generating stations at Epsom, Dorking, Leatherhead, Sevenoaks, and Reigate.

Six undertakings (Barking Town, Bromley, Dartford, Heston and Isleworth, Stoke Newington, and Wickford) made application for altering their systems and pressures of supply in most cases from d.c. three-wire to a.c. three-phase. In cases where the applications related to pressures slightly higher or lower than the standard, 400/230 volts, the Authority suggested to the Electricity Commissioners that they should allow over a period an increased percentage in the permitted variation of the declared pressure at consumers' terminals. The Commissioners are understood to be considering this suggestion in connection with the revision of their regulations.

Railway Signalling in India

The all-electric system at Churchgate Station, Bombay

DURING the last five years railway development in Bombay has been most marked. First of all there was the opening of the G.I.P. suburban railway electrification, then the opening of the B.B. & C.I. suburban electrification, followed by the extension of Victoria terminus and the opening of the G.I.P. main-line electrification to Poona and Igatpuri. This year has been marked by the closing of the B.B. and C.I. terminal station at Colaba, and the opening of a new terminus, the Central Station at Bellassis Road, for main line traffic and the remodelling of Churchgate station to make it the terminal station for local suburban traffic.



General View of Bombay Central

The foundation stone of Bombay Central, as the new main line terminus is named, was laid by Sir Ernest Jackson, the Agent of the Bombay, Baroda and Central India Railway, in March, 1929, and the station was formally opened for traffic by Sir Frederick Sykes, the Governor of Bombay, on December 18th last year.

Interior Wiring of Stations

The bulk of the interior wiring is by means of single-core c.t.s. cables run behind the plaster and under the roof. The lighting standards along the well laid out entrance drive are supplied by means of armoured cables suitably tapped and subdivided by means of link disconnecting boxes. The fittings were designed by Holophane, Ltd. The lifts were by the Express Lift Co., and each is capable of raising a load of eight persons at a maximum speed of 150 ft. per min. Two-speed control switches, operated by the attendant, are fitted. A separate automatic exchange was installed by the Bombay Telephone Company, with connections to all of the principal offices.

Colour-light Signals at Churchgate

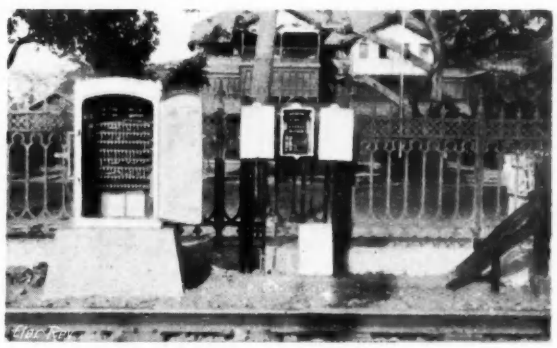
Over seventeen miles of c.t.s. cable, about 1,700 yards of underground cable, forty-two link disconnecting boxes, and a large quantity of "Nomet" wiring and other accessories were supplied by Messrs. W. T. Henley's Telegraph Works Co., Ltd., for the electrical installation of this station.

Signalling Systems

The signalling system at Bombay Central is electro-pneumatic, and that at Churchgate station is all-electric; the latter is claimed to be the first of its kind in India, and is one of very few at present installed anywhere. The cabins are reinforced concrete structures and conform with the general architecture of the stations; they are cool, well lighted and built to suit tropical weather and the type of signalling installed. There is an upper and lower portion to each cabin; the upper portion contains the lever frame and the lower is used for housing the transformers, relays, &c. In each cabin is an illuminated diagram showing the track layout and indicating the movement of rolling stock. For interior wiring some 25,000 yards of "Henlex," insulated 1/0.44 in. conductor braided and flame-proof compounded was employed.

The track cable at Bombay Central comprises thirteen miles of single- to 12-core s.w.a. cable, 1/.064 in., 7/.029 in., 7/.064 in. and 19/.064 in., Henlex insulated, braided, and hessian taped overall. At Churchgate some 5¼ miles of 2- to 9-core cable s.w.a., v.b. sheathed cable is used, taped, braided, and compounded overall. The cable was made by Henley's to a specification drawn up by the Railway Company and its consulting engineers.

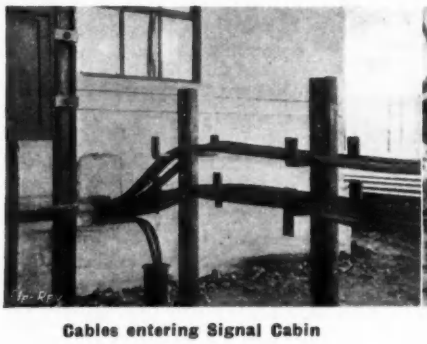
A considerable amount of somewhat similar cable had been buried directly in the ground, but experience had shown that chemical action and electrolysis shortened its life, and therefore at Bombay Central and at Churchgate the cable as far as possible was installed above ground. The main run of cables is hung upon brackets bolted to iron posts fixed at a distance of 3 ft. apart or to iron brackets on a substantial boundary fence; only those portions of cable between the main run and the unit are buried direct in the ground, these being laid in sand about 2 ft. 6 in. from the surface. Where the main run of cables crosses under the track, they are put into iron trunking so that, by removal of the lid of the trunking, they can be examined with a minimum of interference with the permanent way. This method is also adopted for protecting the cables going from the station end of the cabin. For controlling the colour-light signals multi-core cables are used, the number of cores being 5, 7, 9 or 12, according to requirements. Separate cables are run to all points.



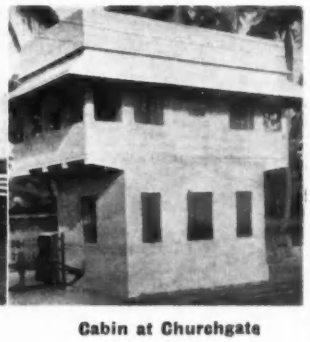
Cables Rising to Disconnecting Box

Reticulation of Signal Power Main

The 110-V signal power main is a twin 7/.064 in. cable running from the cabin to the outermost point on one side of the track and back again on the other side, thus making a complete ring with disconnecting links at any point or signal location. In this way it is possible in the event of a fault to isolate any portion of the cable. For track feed and relay pick-up, twin 7/.029 in. cable of similar type is used and where impedance bonds are installed the connection is made inside the bond. On the single rail track the twin cable is terminated in a cast-iron box, mounted on a small concrete foundation and from the box short leads are taken through ¾-in. pipe to the rails. Great care was taken to make the location of a fault an easy matter and by the introduction of junction boxes it is possible to locate quickly any faulty cable without expensive testing instruments or skilled labour. Approximately thirty-six miles of "Henlex" insulated cable was used for the two installations.



Cables entering Signal Cabin



Cabin at Churchgate

Turbine Reliability

THE 1930 report of the Prime Movers Committee of the National Electric Light Association (U.S.A.) includes operation records for 324 turbines of from 20,000 to 160,000 kW, of which five exceeded 65,000 kW. Records are also given of turbines working at pressures above 1,000 lb. per sq. in. gauge, all of less than 20,000 kW. Each component unit of two or more generators is regarded as two or more turbines.

The 324 turbine units have an aggregate rated capacity of 11.27 million kW, and generated 42,525 million kWh in 2.82 million hours. The idle hours amounted to 1.05 million, and the outage hours to 258,536. Outage hours due to turbines were 125,180; to generators, 42,813; to condensers, 70,726; to other causes, 19,817.

TABLE I.
Turbine Outages.

	Outage hours.	Per cent. of total.	Machines affected.	Outage hours per machine.
Steam casing	2,580	2.06	56	46
Governors	2,549	2.06	114	21
Control gear	7,113	5.68	146	49
Shaft packing	2,492	1.99	64	39
Nozzles and diaphragms	801	0.64	19	42
Shaft	600	0.47	15	40
Wheels or spindle	4,957	3.96	25	197
Buckets or blades	10,918	8.72	49	226
Vibration	3,996	3.19	26	154
Bearings	1,699	1.35	64	27
Lubrication system	2,174	1.74	129	17
Cleaning oil system	2,970	2.37	111	27
Annual inspection and adjustment	75,776	58.22	205	370
Miscellaneous	6,555	7.55	81	81
Total for repair and maintenance	125,180	100 00	—	—

TABLE II.
Generator Outage.

	Outage hours.	Per cent. of total.	Machines affected.	Outage hours per machine.
Vibration	536	1.25	10	54
Oil leakage	150	0.35	17	9
Armature core	55	0.13	4	14
Armature windings	4,487	10.49	20	224
Field windings	15,858	37.04	42	377
Exciter	1,460	3.41	76	19
Annual inspection and cleaning	11,488	26.83	99	115
Miscellaneous	8,779	20.50	95	92
Total for repair and maintenance	42,813	100.00	—	—

The total "outage factor" was 9.17 per cent., which is the lowest yet recorded; that of the turbine only was 4.44 per cent., as compared with 5.02 per cent. in 1929. The demand-hour outage due to turbine trouble, expressed as a percentage of total turbine outage, has decreased to 33 per cent. from 42 per cent.

An annual or scheduled inspection and overhaul was made in the case of 205 sets, and the average number of hours required for the inspection was 370 per set. Blading troubles were once more the greatest single source of turbine-caused outages, but the number of hours decreased from 294 to 226.

There is an increase in both total and demand-hour outage due to generators. Average outage hours due to field windings have increased from 110 for each of 51 machines affected in 1929 to 377 hours for each of 42 machines affected in 1930.

Average outage hours due to armature windings have increased from 112 for each of 19 machines affected in 1929, to 224 hours for each of 20 machines affected in 1930.

The number of units reported of 50,000 kW or more has increased to 51 from 42 in 1929, with an increase in average capacity to 87,624 from 69,330 kW. The total outage has decreased from 14.2 to 12.55 per cent. of the total period hours. As in other groups, there is an appreciable decrease in turbine outages, but an increase in generator and condenser troubles.

The total outage for the ten units operating at 1,000 lb. per sq. in. steam pressure was high, averaging 19.75 per cent., as compared with 10.71 for 17 turbines operating within 550 and 1,000 lb. per sq. in.

TABLE III.
Condenser Outage.

	Outage hours.	Per cent. of total.	Machines affected.	Outage hours per machine.
Leakage	5,272	7.45	126	42
Cleaning	50,496	71.39	225	224
Tubes	4,994	7.06	65	77
Shell	705	0.99	38	18
Circulating pumps	4,201	5.94	88	48
Condensate pumps	1,524	2.15	63	24
Air pumps	1,412	1.99	80	17
Miscellaneous	2,121	3.03	71	30
Total for repair and maintenance	70,726	100.00	—	—

TABLE IV.
Outages Due to Other Causes.

	Total hours.	Per cent. of total.	Machines affected.	Outage hours per machine.
General piping	6,643	33.52	146	45
Boiler room	1,865	9.41	34	55
Plant, electrical	2,714	13.70	103	26
Outside electrical	6,883	34.73	42	163
Miscellaneous	1,712	8.64	53	32
Total for repair and maintenance	19,817	100.00	—	—

The service demand availability factor (the ratio of service hours to demand hours) showed a slight decrease in 1930, 129 machines (39.8 per cent.) having a factor of 100.

The fouling of turbine buckets varied in importance from the mere necessity of cleaning them at the time of annual inspection to losses in capacity of from 15 to 50 per cent. and forced shut downs. The consensus of opinion of the operating companies seems to be that all troubles of this nature may be prevented by properly controlling the condition of the boiler water.

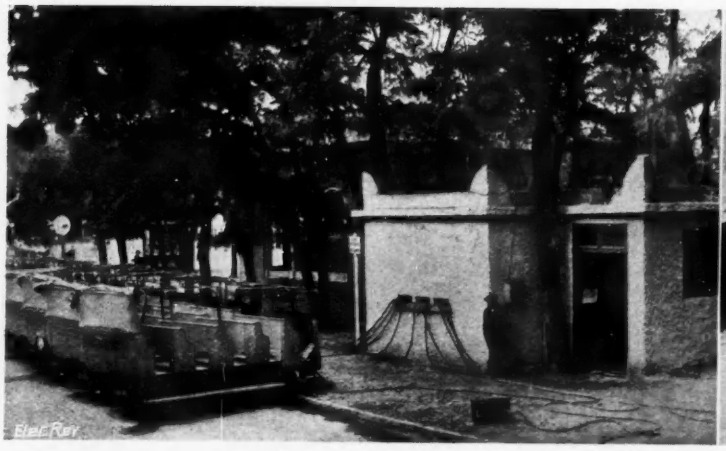
Electric Runabouts at the Paris Exhibition

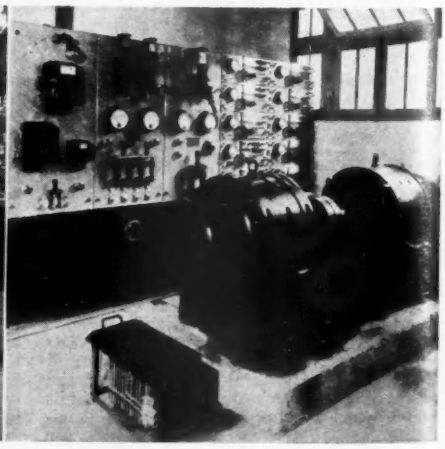
THE "Railodoks" seen at the British Empire Exhibition at Wembley in 1924 have been imitated at the wonderful Colonial Exhibition in Paris. With the experience gained during the last few years in electric traction, improved types have been evolved which have made a success of this method of conveying parties round the grounds.

The organisation has been conceived by the Société des Véhicules Electriques under the guidance of M. Gasquet, the president, and M. Bouchon. Vehicle and battery manufacturers have taken part and the fifty-eight cars are of various makes, such as the Fenwick, Renault, Satme, and Panhard. The batteries consist usually of 24 cells of 300-Ah capacity, except on the Renault cars which have 40 cells of 225-Ah capacity each. The batteries have been supplied by Dinin, T.E.M., S.A.F.T., and the Société Tudor.

There are two charging stations, one of them having a capacity of 320 kW. Two or three charges a day are given to the batteries of each vehicle, including the night charge, and the cars are in demand constantly in the evening (up to midnight) and particularly on Sundays and holidays. On such days there is a long queue of people waiting their turns for the 40-minute ride round the grounds (a fixed route) at a cost of 10 fr. There is also a shorter route taking 20 minutes at 5 fr. The cars carry from 14 to 18 passengers.

No better way could be found of seeing the marvellous illumination of the Exhibition at night time.—T. C. Elliott.





A German 220-kV Line

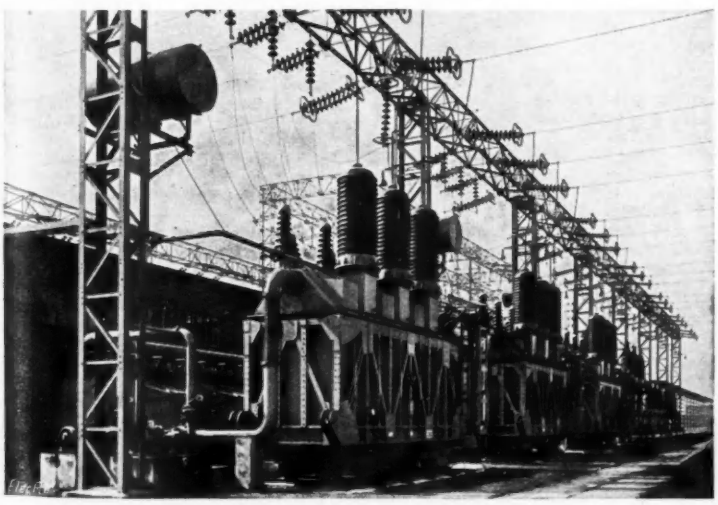
The Rhineland-Vorarlberg 220/110-V load-equalising interconnected network linking up steam and hydro-electric stations

ECONOMIC load equalisation and the creation of the most favourable operating conditions were the objects aimed at when interconnecting the steam power-producing plant of the Rheinisch-Westfälisches Elektrizitätswerke Gesellschaft (R.W.E.) at Essen, Germany, with the large South-German and Alpine hydro-electric stations, including pumped storage stations having short operating periods to permit surplus power to be utilised at times of peak load.

To enable the plan to be realised, the R.W.E. built a double 220-kV overhead transmission line to connect the transformer station at Brauweiler, near Cologne, with Burs in the Vorarlberg. The whole of the transmission lines from the large Rhenish steam stations (with an aggregate output of roughly 1,000,000 kW) and the branch line from the pumped-water storage station at Herdecke in the Ruhr (140,000 kW), as well as the main distribution lines, are combined in three systems of 220-kV busbars and five of 110 kV at Brauweiler, which is not only the chief distribution sub-station of the R.W.E., but also the main switching and control centre for the 220-kV and 110-kV networks. The transformer station at Burs, near Bludenz, is the centre of the water-power stations of the Vorarlberg, the development of which is still progressing. From Burs the line leads northwards *via* 220-kV transformer stations at Herbertingen on the Danube, Hoheneck near Stuttgart, Rheinau near Mannheim, and Kelsterbach near Frankfurt, to Brauweiler.

Rhineland-Vorarlberg 220-kV Line

The Siemens-Schuckert Works Co. of Berlin received the order to equip six sub-stations and, whilst retaining the test voltages prescribed by the rules of the Association of German Electrical Engineers (V.D.E.), all parts were so designed as to withstand 30 per cent. higher flash-over voltages in air and under oil than the minimum values prescribed by the V.D.E. The material supplied included fourteen 220/110-kV, 60,000-kVA transformers, aggregating 840,000 kVA; twelve 110-kV ± 10 per cent., 60,000-kVA induction potential regulators; 36 10-kV, 6,000-kVA compensating reactance coils; 38 three-tank 220-kV oil switches; 125 three-pole 220-kV isolating switches; 87 spreader-insulator type 220-kV current transformers; and 63 220-kV cascade potential transformers. In addition, for the 110-kV parts of the sub-stations at Brauweiler and Burs, 58 three-tank 110-kV oil circuit breakers, 233 three-pole isolating switches for 110 kV, 114 spreader-insulator type current transformers for 110 kV, and 130 cascade potential transformers for 110 kV, as well as indicating and recording instruments and time-step reactance protection gear, have been supplied.



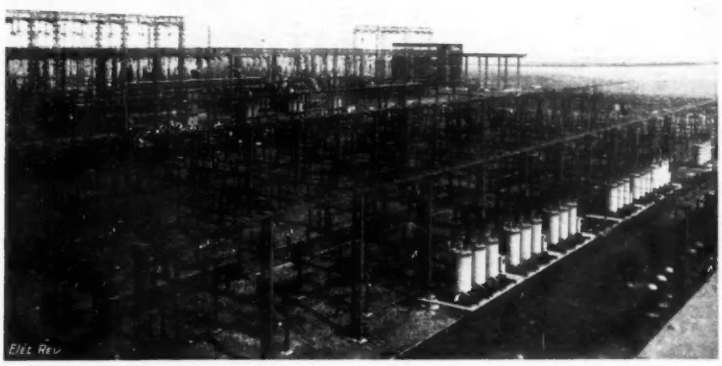
Three 60,000-kVA Transformers at Brauweiler

The fourteen main transformers have a ratio of 220/110 kV when star-star connected and of 220/63.5 kV in star-delta connection. The change-over of the secondary connections is effected at terminals outside the covers, and by connecting the halves of the low-voltage windings in parallel inside, secondary voltages of 55 and 31.75 kV can be obtained. The primary star-points are brought out and insulated for the full line voltage for connection to earth-fault limiting devices. When the secondary windings are star connected the secondary star-point is likewise accessible for the same purpose. The transformers have a tertiary winding connected in delta for an output of 18,000 kVA at 10 kV, to which compensating reactance coils or phase-advancers can be connected. The test voltage was 440 kV, while the flash-over voltage of the bushings was over 650 kV.

Each tank was built to the utmost loading-gauge limits permitted by the railways in the form of a cage approximately 28 ft. in length. The transport weight of each transformer and special truck was about 250 tons.

When in operation, the heated oil is circulated by two centrifugal pumps through a cooler consisting of nine cells grouped together in threes into a block, which is connected to a ventilating chamber and cooled by a Siemens-Betz streamline fan. The transformers, cooling cells, and ventilating chambers are provided with wheels, so that they can easily be removed for overhaul.

Potential regulators between the main transformers and the 110-kV busbars have an output of 60,000 kVA and a range of ±10 per cent. in ±8 steps on load; in addition they can be arranged to give 63.5, 55, and 31.75 kV at the same load. Tank pockets suffice for self-cooling up to an output of 40,000 kVA; at higher loads additional cooling is effected from below by means of a small motor-driven Siemens-Betz fan, which is set in motion automatically when the load exceeds the predetermined limit. Each regulator consists of two transformers in a common tank, inside which are a step selector and load switch, the primary side being in series with the line and bridged by parallel condensers as a protection against surges. The selector can be operated by hand or a three-phase motor, which can either be remotely controlled by push buttons or automatically governed by a current-compounded voltage regulator. Each intermediate and terminal station is provided with six light-load compensating reactance coils, thirty-six in all, each for an output of 6,000 kVA, three of which are connected to the 10-kV tertiary winding of each 60,000-kVA main transformer. They are governed by oil switches with compressed-air drives, hand or remotely operated, or fully automatically controlled by a compensating relay in such a way that the sum of the capacitive and inductive loads of that section of the line becomes zero. This system is stated to have proved superior to pure voltage regulation, since unstable operating conditions are avoided.



110-kV Bus-bars at the Brauweiler Transformer Station

The thirty-eight sets of 220-kV oil circuit-breakers are of the 600-A three-tank type, quadruple break, connected by a rod mechanism and operated by a common motor mounted in a rain-proof housing alongside; breaking is effected by solenoid-operated springs. The 125 isolating switches for 220 kV, 600 A, are motor operated. The potential transformers consist of six sections connected in cascade with their centres connected to the core. They are accommodated in porcelain housings and an additional winding ensures even distribution of voltage over all sections.

Electricity in Light Therapy

The First of the 1931-32 E.D.A. Conferences

THE series of lectures arranged for this winter by the British Electrical Development Association will achieve a popularity and usefulness exceeding even that of the familiar salesmanship conferences which they have replaced, judging by the quality of the first lecture of the series, which was delivered at the Royal Society of Arts in London last week. The subject was "Light Therapy, with Particular Reference to Ultra-violet Irradiation," and the lecturer was Dr. W. Beaumont, M.R.C.S. (Eng.), L.R.C.P. (London.),* hon. medical director of the Institute of Ray Therapy, and medical officer-in-charge of the Municipal Light Clinic in St. Pancras, which treats 1,500 weekly cases.

Dr. Beaumont said that in medicine electricity was used directly and indirectly. In the first case, the patient was placed in an electrical circuit, as in diathermy. In the second case, electricity was made use of to produce electro-magnetic radiations, and the patient was placed in the path of those rays. It was the latter application with which he dealt.

He did not like the term "light treatment," because light was associated with something that could be seen, whereas it was the unseen rays which were of so great a value in this treatment. Again, one could not give ultra-violet ray treatment alone, because other rays had to be applied at the same time, and the influence of the latter in the presence of the ultra-violet was not very clearly understood. The term "actinotherapy" was also misleading, for one had no evidence that the infra-red rays were actinic; rather were they the antithesis, and yet they played an important part in treatment. As to the terms "sunlight treatment" and "artificial sunlight," he pointed out that the composition of sunlight varied from place to place, so that to produce artificial sunlight was something of a problem. He preferred to speak of this treatment as a branch of ray therapy.

Ray-therapy Apparatus

Dr. Beaumont then reviewed and demonstrated apparatus available for ray therapy. For giving a combination of ultra-violet, visible, and infra-red radiation they relied on electric arcs of two classes: the mercury-vapour arc, or quartz mercury-vapour burner, and the open flame arc, more often referred to as the carbon arc, a variety of which was the tungsten arc. The mercury arc was unquestionably the richest source of ultra-violet rays, particularly those of the shorter wavelengths. It was very clean in use and easy to handle, and could be built into a variety of designs for specialised work. For intensive local work the arc could be cooled either by a water jacket or a forced-air draught, and could be used in contact with the skin. In his opinion the mercury-vapour arc was more suitable for treating disease than for its tonic effects.

With reference to the carbon arc improvements had been made, but there was still room for further improvement in design; larger arcs were wanted, with greater current consumption. The carbon arc was not so convenient for applying the shorter ultra-violet rays as the water-cooled mercury-vapour lamp, but it had the advantage of being very rich in the visible and infra-red rays and was very suitable for giving tonic treatment. The carbon electrodes used could be cored with various compounds, and so within certain limits the type of radiation could be varied. There was difficulty in obtaining really good British-made electrodes at a reasonable price, however, and the fumes given off by the carbon arc constituted a definite disadvantage. The tungsten arc was usually only small, of about 5 amperes, but it was very rich in ultra-violet and infra-red rays and eminently suitable for local treatment. Unfortunately, it worked satisfactorily only on d.c. and designs were somewhat crude. He had found it most useful for the treatment of enlarged glands in children.

Outside the ultra-violet band the most popular source of visible radiation was the high-candle-power tungsten-filament gasfilled lamp, which was used often in conjunction with the mercury arc, or for visible radiation and radiant heat.

Infra-red Radiation

Of the infra-red group of generators, the best for therapeutic purposes consisted of a slab (somewhat like a black tile) built up of a graphite resistor in the form of a flat ribbon of considerable length, embedded in fireclay. This graphite element had a high emissivity and could be raised to a temperature just below 300 deg. C. without giving visible radiation. If the graphite slab were backed by an asbestos heat insulator, leaving only one radiating surface exposed, heat loss was restricted and a high temperature was maintained with a comparatively small current consumption. This was the most efficient and economical infra-red generator available.

Dr. Beaumont exhibited a model of an automatic time cut-out, which had not yet appeared on the market, so far as he knew, but would be of great value.

Safety Provisions

He then made some suggestions for improvement. First he urged that all cotton- or silk-covered flex should be replaced by rubber-covered flex. It would also be a great help if every piece of apparatus were connected to the mains by means of a three-pin plug and strong serviceable switch with "off" and "on" in bold letters, which could be seen across the room. All apparatus should have three wires, so that when used on a floor which was not an insulator the apparatus could be earthed. When a resistance was necessary, it should be made a little more attractive, or put out of sight; the heat generated by a resistance of any considerable size was uncomfortable in a small room or cubicle. Treatment-timing clocks should be so arranged that a bell would ring and a pilot light be switched on outside the treatment cubicle, so that when a nurse had several cubicles to attend to, she would know which bell had rung.

Salesmanship "Nonsense"

Salesmanship methods also came under the criticism of Dr. Beaumont, who described a recent experience, when he had listened to a very clever demonstration for ten minutes and had been amazed at the amount of nonsense which it was possible for an intelligent man to learn, repeat, and believe. Much harm had been done to the use of ray therapy by the electrical salesman who made unfounded statements. The gravity of the position lay in the fact that the salesman had usually a sound electrical knowledge of his apparatus. A patient would be influenced far more by a man who talked electrical sense and medical nonsense than by a doctor with a sound knowledge of medicine but who knew little about electrical treatment. People had been persuaded to buy home sets and had treated themselves indifferently, or quite wrongly, so that subsequently they did not believe in ray therapy.

From his personal experience of something like 10,000 treatments, the effect of infra-red radiation on many rheumatic conditions was very striking. Only a few facts had been definitely established beyond doubt concerning the effects of radiation upon the human body. In nearly all cases the source of radiation used had been one giving ultra-violet, visible, and infra-red rays in combination. Whilst irradiation was a source of much benefit to the human body, there were great potentialities for serious harm by inexperienced exposure. There were various conditions which should not be so treated. Further, restlessness, sleeplessness, and irritability, loss of appetite, general feeling of tiredness, and headaches were definite signs of wrong treatment. He emphasised, therefore, that experience and knowledge were required for the selection of suitable cases and for giving the right dosage, and he expressed the opinion that all ray-therapy apparatus should be controlled as rigorously as dangerous drugs.

Finally, he referred to the beneficial results of the correct treatment of children's diseases, such as rickets, &c., tuberculous diseases, the treatment of fractures in elderly people, severe sprains, sleeplessness and restlessness, and rheumatic troubles. Generally speaking, this form of treatment was invaluable for patients recovering from serious operations and long illnesses; the period of convalescence was shortened. It was impossible to practise ray therapy with one type of apparatus only. The strictest attention to the most suitable combination of rays and the correct dosage would give satisfactory results. Too much had been claimed for the value of the ultra-violet rays, while the part played by the infra-red ones had been under-rated. The electrician, the physicist, and the doctor must work together to produce and use the most efficient apparatus.

Discussion

In the course of the discussion some speakers, whilst appreciating the contention that the curing of disease was a matter for the doctor only, pointed out that there was a demand for apparatus which people could use in their homes in order to maintain their health, and that that demand was worthy of fostering. The chairman (Mr. Ll. B. Atkinson) said that he had an arc lamp and a small mercury-vapour lamp in his home, and exposed his body to the rays from them from time to time. Dr. Beaumont's view of the matter was that if he could be assured that such apparatus would be used intelligently there was something to be said for it, but many people could not be trusted to give themselves the proper dosage, and over-doses produced irritability and general change of temperament. That was his own personal experience when subjected to exposure frequently for short periods in the course of his work, which was unavoidable.

Some speakers were a little critical of medical practitioners, the majority of whom, it was said, knew practically nothing about electrical treatment. Dr. Beaumont defended them, however, pointing out that they had a great deal to learn on the medical side in order to pass their examinations, and they were somewhat out of their depth when dealing with electrical treatment. His criticism was directed more at electrical people, who had not been very helpful. He pointed out that in the first application of artificial sunlight treatment in London an ordinary street-lighting arc was used, and added that if electricians had been ahead of the medical profession they would have had something better for the doctors to use.

With regard to time-switch control, which provided a further safeguard against wrong usage, cost constituted a difficulty, and the speaker pleaded for simplicity to reduce installation difficulties. Finally, as showing the growth of the use of light therapy abroad, he said that in Germany there was hardly a doctor who had not a mercury-arc lamp as part of his equipment, and very many light clinics had been established.

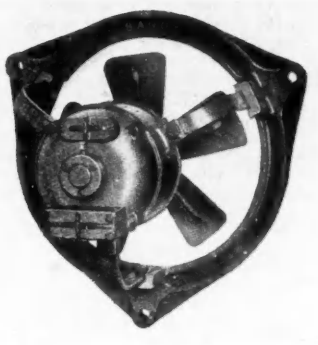
* Author of "Fundamental Principles of Ray Therapy," H. K. Lewis, 6s.

New Apparatus and Devices

for Domestic, Cooking and Heating, Lighting, Power and Scientific Purposes

Fume-proof Fan

The "Bandy" fume-proof fan has been introduced by Berkeley & Young, Ltd., 200, High Holborn, W.C.1, to meet the demand for an exhaust fan suitable for use in fume-laden surroundings such as in cellulose-spraying cabinets, lacquering booths, chemical works and any position where an explosive atmosphere is present. The motor is of the totally enclosed type and is of ample size to prevent overheating when used under normal conditions. Special provision is made for protecting the terminals, and the terminal box is arranged to take screwed conduit. All parts of the fan are adequately protected by special enamel to prevent corrosion. As ball bearings are fitted as standard the fan can be used in either a vertical or horizontal position. The fan is available in a number of sizes with blade diameters varying from 12 to 24 in. and air displacements varying from 1,300 to 5,000 cu. ft. per min.



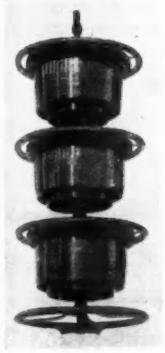
"Bandy" Fume-proof Fan

Vaporiser for Catarrh

A novelty in electro-medical apparatus is the "Trojan" inhaler produced by John Shaw & Sons (Wolverhampton), Ltd., which is claimed to offer relief to sufferers from catarrh and allied complaints. The glass container is filled with a mixture of water and a special inhalant, and the apparatus is connected to a suitable supply (100-250 V) by an ordinary lead and adaptor. After a few minutes' heating, vapour will emerge from the nozzle. The apparatus is supplied complete in a case with a spare glass nozzle and a jar of the inhalant.

E.H.P. Potential Transformers

In order to reduce the disadvantages of e.h.p. potential transformers to a minimum, a new design of the so-called stand-type cascade voltage transformer has been introduced by Oswald Record & Co., 17, Victoria Street, S.W.1. The essential point is that the winding is actually accommodated in the bushing itself. In the case of a normal-voltage transformer the total height is the height of the container plus that of the bushing, whereas the height of the cascade voltage transformer is that of the bushing only. The latter is increased slightly in diameter in order to provide sufficient room for the winding, but in height it is no greater than a normal bushing on a standard voltage transformer. It is therefore evident that there is considerable economy in material and weight, and on the other hand there is considerable saving of room space for the erection and housing of the transformer. In the cascade transformer the iron core is in multiple; for example, for 110 kV there are two iron cores, the windings of which are connected up in cascade, each having a correspondingly higher potential. It is therefore only necessary to insulate between the core and winding for a proportion of the voltage, as the core itself is at a higher potential. This results in further saving and a greater factor of safety in the insulation. The outputs of stand-type cascade voltage transformers fully satisfy all requirements in practice. Alternatively, each core of the cascade transformer can be enclosed in its own porcelain housing and suspended one under the other exactly as the links of a chain. In this way is provided a voltage transformer which requires no floor space.



New Potential Transformer

A Small Cleaner

Its miniature structure and light weight are the outstanding features of the "O.K." vacuum cleaning brush marketed by Andrew Page & Son, Ltd., 99, Albion Street, Leeds. With the dust bag suspended by a strap from the arm the cleaner can be used as a single-hand machine, or carried in a wheeled cradle with a long handle it is suitable for floor use in the ordinary way. The machine has both a motor-driven brush and a straight brush attachment, and it can also be used as a straight suction machine. It is made in two models, one with a 3½-in. nozzle and weighing 3 lb., and the other with a 5½-in. nozzle and weighing 4½ lb.

Petrol-electric Truck

Among recently granted patents is one for a novel form of petrol-electric motor wagon to Messrs. C. H. Fowler and H. Walker, of the Steam Plough and Locomotive Works, Leeds. The vehicle has ten road wheels, two at the front and eight at the rear, the latter being mounted on bogies in which each group of four wheels is supported in the centre by a pivot, the arrangement being such that each of the eight wheels can take an even share of the load, no matter how uneven may be the ground over which the vehicle travels. The engine drives an electric generator and each of the rear wheels is served direct by a separate electric motor.

Improved Spotlight

A recent introduction of the Revo Electric Co., Ltd., Britannia Works, Tividale, Tipton, Staffs, is a spotlight lighting unit for concentrated displays, shop windows, and interior lighting. The reflector has a diameter of 10 in., and is fitted with a focusing arrangement for the lamp. A universal wall bracket allows the fitting to move in any direction. The fitting is designed for use with lamps up to 150-W. Colour-screen equipment for use with the spotlight can also be supplied.

A Wash Boiler

A recent production of Hotpoint Electric Appliance Co., Ltd., 24, Newman Street, W.1, is a 10-gal. wash boiler, the outer casing and lid of which are constructed of steel, enamelled french grey. The interior container is built of stout-gauge copper, tinned inside, and the complete boiler is mounted on three cast-iron legs, finished in stove black enamel. A 3-kW or 4-kW "Hotpoint" sheathed wire immersion heater is accommodated in the sump at the bottom of the interior container, and is protected from the clothes by a removable perforated cover. A brass draw-off tap empties the boiler to the sump level, and a tap is fitted for draining the sump. A three-heat series-parallel switch mounted on a wooden block and 4 ft. of 4-core c.t.s. cable are optional accessories. The apparatus has been designed for hard use on housing estates, and is suitable for hiring and hire-purchase schemes.

"Hotpoint" Wash Boiler

A Floodlight Unit

The Revo Electric Co., Ltd., Britannia Works, Tividale, Tipton, Staffs., has added to its products a heavy-duty floodlight projector for lamps of 300-500 watts. Made of cast-iron the lamp body is fitted with a parabolic chromium-plated reflector, and a wire-reinforced glass of 13½ in. diameter. Focusing can be easily carried out by means of a special arrangement provided. The substantial base of this fitting measures 9 in. across, and provides solid mounting for the fitting, which has a maximum height of 22½ in. A watertight cable gland entry is provided, and the fitting is amply ventilated, yet is perfectly weatherproof. The mounting permits the projector to be swivelled through a wide angle.

Revo Floodlight Projector

The Societies and Their Doings

Addresses at I.E.E. Centres

Electrical Temperature Measurement

THE measurement of temperature had not received the attention it deserved from the electrical engineer, said Mr. P. M. Hogg, in his address as chairman of the MERSEY & NORTH WALES (LIVERPOOL) CENTRE of the INSTITUTION OF ELECTRICAL ENGINEERS. He defined the thermodynamic Centigrade scale and the international scale, pointing out that in the latter case over the range between minus 190 and plus 1,063° C. the definition of temperature involved the use of two electrical pyrometers: a platinum resistance thermometer and a platinum and platinum-rhodium thermocouple; above 1,063° C. definition was based on the relation between the temperature of a "black body" and the intensity of its emission of monochromatic visible radiation.

The three main classes of industrial pyrometer were described: (i) the platinum resistance type was very suitable when an open scale at some given temperature was required and for the accurate measurement of comparatively low temperatures. In industry generally, however, its relative importance had probably decreased, and temperatures above 300° C. were now more often measured by (ii) the thermo-electric type.

The choice of any two thermocouple metals depended largely on the maximum temperature to be measured and on the desired accuracy. One element of pure platinum and another of an alloy of 90 per cent. platinum and 10 per cent. rhodium could be used to measure temperatures up to 1,500° C., but adequate potection of the elements from contamination was very difficult above 1,300° C. For continuous use above 1,100° C. it was the only satisfactory couple and for the measurement of lower temperatures its superior constancy of calibration often rendered its use desirable and economical. Base metals and their alloys were, however, very widely used up to 1,100° C. The electromotive force developed by base metal couples was between four and seven times that developed by the rare metal couples at the same temperature.

The life and behaviour of a thermocouple depended on the degree to which it was protected from contamination by high-temperature gases and fumes.

A millivoltmeter scaled to indicate temperature directly was usually employed to measure the electromotive force developed by the thermocouple, and the percentage variation of the total resistance of the circuit could be neglected if the constant resistance of the indicator was high compared with this variable resistance. Multipoint recorders had a selector switch which connected each thermocouple to the millivoltmeter in turn, so that as many as six couples could record on one chart.

(iii) Total radiation pyrometry was based on the relation between the temperature of a "black body" and the total energy radiated per unit area of its surface in unit time. In one type radiation at all wavelengths from the hot source was focused by means of a concave mirror of stainless metal upon the hot junction of a thermocouple, which was shielded from direct radiation. The chief advantage of the total radiation pyrometer was that it could be used with a recorder.

Optical pyrometry was based on the relation between the temperature of the "black body" and the intensity of a visible radiation of a selected wavelength. The disappearing-filament type had a telescope with an objective lens which produced an image of the hot source in the plane of the filament of a small electric lamp placed inside the telescope tube. An eye-piece fitted with a red glass filter enabled the brightness of the red ray from this image to be compared with the filament through which current was adjusted by means of a variable resistance until the tip of the filament seemed to disappear in the background of the image. The current was then a measure of the temperature of the source.

The disappearing optical pyrometer had many advantages over the total radiation pyrometer; it was more accurate, but could not be used with an automatic recorder.

A Survey of the Electrical Position

IN his address last Tuesday as chairman of the NORTH-WESTERN Centre of the INSTITUTION OF ELECTRICAL ENGINEERS, Mr. L. Romero reviewed the present state of development of the principal uses of heavy-current electricity in this country, indicating the most important matters on which attention should be concentrated for the purpose of facilitating development. He then referred to the measures of rationalisation which electricity supply was undergoing, and finally drew attention to certain remoter, but very important, effects of the development of electrical engineering on the life of the community.

Among the uses of electricity, he mentioned lighting first, because it was the basis on which the business of the public supply of electricity had been built up. The change-over to electric lighting in cities was almost complete for every type of premises except dwelling houses. The majority of supply engineers with d.c. networks to change over to a.c. were content with the present rate of progress in connecting new d.c. consumers, as the cost of the change-over to a.c. would be correspondingly increased by any increase in the rate of connection of new d.c. consumers. Even with this objection out of the way, however, he did not feel much enthusiasm for the prepayment meter assisted-wiring system, as the high rate per kWh charged was bound to limit its use to lighting only. He thought, however, that the next ten or fifteen years would see practically all non-electric premises in our towns changed over to electricity, at least for lighting. An increase in street-lighting illumination values had been caused largely by the great improvements which had been made in the efficiency of electric lamps, and also by reductions in the price of electricity. The present severe and prolonged trade depression had naturally had an adverse effect on the amount of electricity used for industrial power purposes, but one of the effects of the rationalisation of industry must be an increased use of electric power.

The use of electricity for building heating was developing, at present, chiefly in domestic premises. Electric fires were being installed in very large numbers in domestic premises every winter, and in the normal course of the English climate they were used intermittently and with a fairly high diversity factor for about nine months of the year. The load thus provided was quite respectable and satisfactory, but fires constituted a source of trouble when the weather (at very rare intervals) turned arctic for two or three weeks.

Many supply undertakings were subsidising the development of the cooking load by hiring cookers at a substantial loss, which was very much less than it was a few years ago owing to the great reduction in maintenance costs which had been brought about by improvements in design and manufacture. No efforts should be spared to reduce prices still further. Domestic water heating was destined to become one of the more important loads in the future, but three main conditions must be fulfilled:—A fairly low rate per kWh; facilities for the hire of apparatus at low rates; and vigorous propaganda. The use of electricity for the application of heat in manufacturing processes opened up a wide field for development which had not been very much cultivated; a number of interesting installations were being put in, or were projected, in their district.

The complete electrification of our railways would now appear to be almost assured, the only matter in doubt being the date of conversion. For street and road traction there was a strong tendency to abolish rails in favour of pneumatic tyres, and while electrical engineers might regret the immediate effects of this tendency, they must, as members of the community, welcome the change. The principal reason why more trolley-'buses had not been used was that it was much easier to introduce petrol 'buses. The majority of tramway managers had taken this line of least resistance, but he hoped that they might be persuaded before it was too late that the long view was the right view. Electricity supply was being rationalised in a number of important ways. He was a firm believer in the soundness of the general idea of the Grid. The next matter in importance, if it was not the most important of all, was the standardisation of the voltages at which consumers were supplied. The change-over of consumers' supplies from d.c. to a.c. was also being extensively carried out. There was very general agreement that tariffs should also be rationalised, but progress in this direction would probably continue to be slow unless it was found possible to impose a standard form of tariff by legislation. The present system allowed the short-hour consumer to obtain his supply at considerably under cost, to the detriment of the long-hour user. Standardisation would probably prove beneficial in reducing the number of standard sizes of cable, and the number of standard meter capacities.

Politics and the Engineer

WHETHER he liked it or not, the electrical engineer would be bound in future to take more interest in politics than he had done hitherto, was the opinion expressed by Major J. Wayne-Morgan, chairman, in his address to the WESTERN CENTRE of the INSTITUTION OF ELECTRICAL ENGINEERS at Cardiff. Some of them had opinions of their own about purchasing electricity in bulk in preference to generating it themselves, but in the interest of the national weal they must all unite to ensure the grid scheme's success. Commercially it was essential, the more so in view of recent events, that the fullest possible use be made of the service offered by the Central Electricity Board.

A dangerous aspect was the possibility of the grid becoming a plank for party politics, for if political and not engineering considerations were allowed to become deciding factors nothing but failure could be expected. The electrification of the main-line railways was open to discussion; although conversion might bring about a steady and welcome supply of work, spread over a period of years, he sincerely hoped that the final decision would be based on engineering facts, not on political policy.

Perhaps the industrial difficulties of the country might be due, at least in part, to the fact that the Government had been so largely in the hands of "professional politicians." It was essential for the engineer to take a greater part in the government of the country, although he hoped that those who did would remain engineers and not become "professional engineering politicians."

Business and Industrial Notes

The Week's Electrical Trade News from all Sources. Commercial and Industrial Developments, Business Changes, Market Prices for Materials, Trade Openings, New Publicity Literature, Liquidations, and Failures

E.T.B.I. Ball

Under the auspices of the Electrical Trades' Benevolent Institution, the thirteenth annual ball will be held in Newcastle-on-Tyne on Friday, November 27th, in the Grand Assembly Rooms, Barras Bridge. Mr. R. P. Sloan, the newly-elected President of the North-East Coast Section of the Institution, will receive the guests. The Section is particularly fortunate in having as its president so well-known a man as Mr. Sloan, the chairman of the Newcastle-upon-Tyne Electric Supply Co., Ltd. This annual event in the North is very popular, and it is the means of raising considerable sums for the E.T.B.I. funds. Members of the industry are asked to remember the date, and to note that tickets may be obtained from the Dance Secretary, Mr. F. W. Page, of the British Thomson-Houston Co., Ltd., Pilgrim Street, Newcastle-upon-Tyne.

The competition this year in aid of the funds of the Institution, will take the form of a "divining disc," which will turn electrically for three hours. The number of turns will depend upon money subscribed by ladies and gentlemen, and competitors have to estimate the number of turns which will be made. Particulars of the competition, and tickets (1s. each), in books of 20, can be obtained from Mr. R. Robson, Electricity House, Haymarket, Newcastle-on-Tyne.

Industrial Managers

In our leading article (ELEC. REV., October 9th) regarding the annual conference of the British Works Management Association, we quoted the views of Mr. G. Hurford, the chairman of the Association, respecting the necessity for increased efficiency in our industrial life and we alluded to the important influence that industrial managers could exercise in bringing this about. Mr. Hurford in the views expressed at the meeting did not intend to convey the idea that industrial managers were the only people to carry the load nor to suggest that they were at present fully occupied. His remarks were:—"It is true that the necessity for greater efficiency applies to every phase of our industrial and business organisation, but the greatest load will, undoubtedly, fall upon the shoulders of those actively engaged in works management; in other words, the greatest responsibility will be borne by our industrial managers, who have, or should have, both the knowledge and opportunity required to increase our competitive industrial efficiency, and I am sure that both labour and capital realise this."

It should be stated here that the underlying object of the British Works Management Association is to enable its members to improve their technique and knowledge, in order that, not only they, but British industry as a whole will benefit. We wish the organisation every success in its efforts to secure these great ends. A pamphlet containing particulars of the Association can be obtained from the offices: 51, Palace Street, Westminster, S.W.

The E.D.A. November Programme

With its November sales and publicity programme the British Electrical Development Association is issuing a programme for the second section of the Eda Electric Homes Campaign (Three Plug Points), October-December, 1931. This contains particulars of advertisements to be inserted in the London and provincial newspapers and in periodicals; the organisation of demonstration electric houses and electric home lectures; and the circulation of the "Three Plug Points" booklet. A folder illustrating advertisements to be used during the campaign is included. The Association's monthly programmes will contain window displays, local advertisements, etc., specially designed to link local development activities with the national advertising. In the programme for November, as in preceding months, illustrations of two suggested window displays are given. One is a special display of electric fires, and the "lay-out" is capable of adaptation to windows of all sizes. The other display is a reminder of the approach of the Christmas season, and has been prepared for the benefit of those whose policy it is to commence the Christmas appeal early in November. All the usual monthly features are retained and a calendar of salesmanship conferences to be held in London and the provinces is included. The two suggested window displays are shown in the illustrations at the bottom this page.

The Blackpool Illuminations

Some very amusing and effective installations were carried out by the General Electric Co., Ltd., in connection with the annual illuminations at Blackpool. At the Open Air Baths a tableau portraying two performing seals with a ball greatly

An Amusing Osram Installation at Blackpool

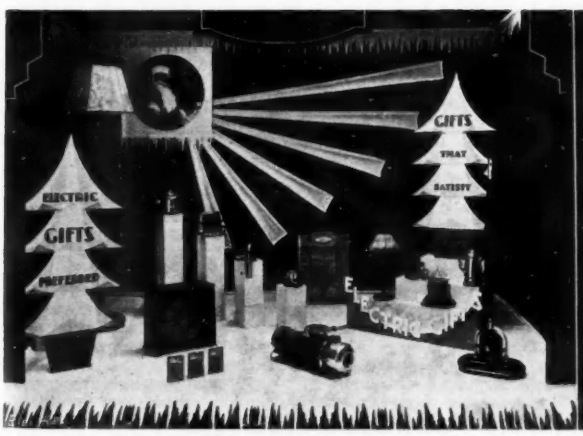
delighted the large crowds of spectators which assembled nightly. A scene from "Cinderella" was depicted at the Cliffs, Bispham, and is reproduced above. For the various illuminations staged at Blackpool the G.E.C. supplied nearly a quarter of a million "Osram" lamps.

A South London Display

With reference to the description of the new showrooms of the London Electricity Supply Corporation, which appeared in our issue of October 9th, the electrical installation was carried out by Mr. W. M. Williamson, not Mr. W. W. Williams, as stated. Mr. Williamson also rewired the head offices of the company, and is now wiring its new building in Stamford Street, S.E.

A Booklet for Jointers

A further booklet for the assistance of jointers has recently been issued by Messrs. W. T. Henley's Telegraph Works Co., Ltd. This latest publication illustrates step by step the correct method of jointing and connecting up "Henley" fuse and link disconnecting boxes, and will be found of great value to all who are engaged in the supply and distribution side of the electrical supply industry.



A Christmas Window Suggestion

The E.D.A. Heating Display

New Australian Companies

Three companies have recently been registered in Sydney for the purpose of taking over the businesses of the Australian Electrical Manufacturing Co., Ltd., Australian General Electric Co., Ltd., Australian General Electric Refrigerator Co., Ltd., Edison Swan Electric Co., Ltd., Ferguson, Pailin, Ltd., Installation and Equipment, Ltd., and Metropolitan-Vickers Australia Proprietary, Ltd.

They are the Associated General Electric Supplies Co., Ltd. (capital £400,000), the Associated General Apparatus Co., Ltd. (capital £150,000), and the Associated General Electric Specialties Co., Ltd. (capital £50,000). The subscribers in each case are Messrs. F. B. Clapp, L. F. Burgess, W. A. Dean, C. F. Sharpe, S. F. Palmer, C. Minter, and L. C. Saunders.

Social Events

The G.E.C. Swimming Club recently held a swimming gala at Holborn Baths. The full programme covered eighteen club and open events, at the conclusion of which the prizes were presented to the successful competitors by Mrs. Leslie Gamage.

Another recent swimming gala was that of the Athletic & Social Club of Standard Telephones & Cables, Ltd., which took place at the Holborn Baths yesterday (Thursday).

Scottish Hire-purchase Law

Criticisms of the present law regarding hire-purchase in Scotland and the need for its revision are contained in the report, issued on October 13th, of the Committee appointed by the Secretary of State for Scotland to consider this subject. In its findings the Committee, over which Lord Fleming presided, considers that agreements could be expressed more simply and concisely, and it recommends that every person who enters into a hire-purchase agreement should be provided with a copy of the agreement. It also recommends that the hirer shall have power to terminate his contract on returning the article and paying instalments up to date; and that imprisonment should only follow the granting of a warrant on special application.

Australian Electrical Imports

During June last the value of imports of electrical machinery and appliances into Australia totalled £119,830, as compared with £372,620 in June, 1930.

London Commercial Travellers' Benevolent Society

The forty-fourth anniversary festival dinner of this society, which was originally fixed for Thursday, October 22nd, and postponed in consequence of the approaching General Election, has now been arranged to take place at the Trocadero Restaurant, on Thursday, February 4th, 1932. Sir Hugo Hirst, Bart., chairman of the General Electric Co., Ltd., will preside.

An " Exide " Luncheon

The Chloride Electrical Storage Co., Ltd., gave its annual luncheon in connection with the Motor Show at the Clarendon Restaurant, Hammersmith, on October 15th. Mr. D. P. Dunne, joint managing director, again presided, and Sir Malcolm Campbell was the guest of honour. In an after-luncheon speech Mr. Dunne referred to the company's widespread activities, and stated that during the past year it had reduced the prices of its accumulators and dry batteries by about 20 per cent. Touching upon the subject of economy, he pointed

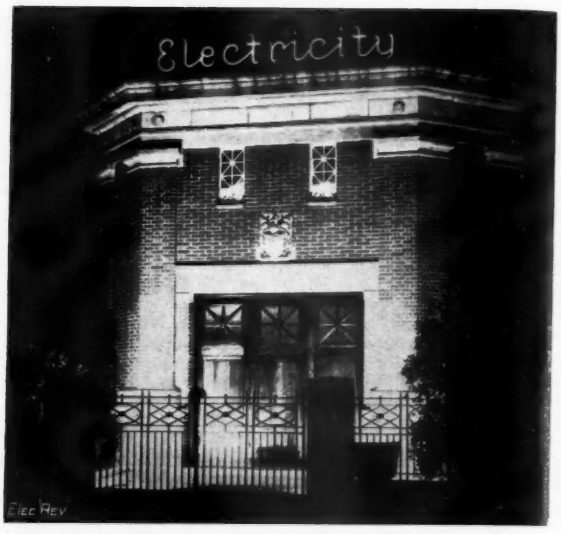
At the " Exide " Motor Show Luncheon

out that there was a world of difference between mere saving and economy. The former accomplished nothing, but economy was a balancing of outlay against prospective results and led to activity. Sir Malcolm Campbell extolled the merits of " Exide " batteries, and, later, films were exhibited showing Sir Malcolm setting up a new motor speed record and in other events.

The accompanying photograph taken at the luncheon shows Sir Malcolm Campbell with Mr. Dunne (right) and Mr. H. V. Schofield, the company's export manager (left), as well as two pretty " Exide " girls.

Night View of a Substation

We are indebted to Mr. C. H. Yeaman, electrical engineer to the City of Stoke-on-Trent, for the photograph reproduced below showing the Kingsway substation (the most important in the city) by night. The front of the building is effectively floodlighted, and the neon sign on top provides a constant reminder of the advantages of advertising by electricity. Stoke-



on-Trent was well to the fore among provincial centres during the Faraday celebrations, special floodlighting and window displays being especially notable. Mr. Yeaman delivered a series of five public lectures on Faraday, and his efforts were well seconded by the local Press. A further lecture, at Leek, has been postponed until after the General Election.

Glasgow Radio Exhibition

Lord Provost Sir Thomas Kelly on October 13th declared open the *Glasgow Weekly Herald* Wireless Exhibition in the McLellan Galleries, Glasgow. The exhibition breaks new ground in Glasgow, and all the well-known radio manufacturers are represented.

Employment During September

The October *Ministry of Labour Gazette* states that employment in the engineering industry during September showed a further decline on the whole: electrical engineering remained slack, and showed a slight decline. The number of unemployed in the engineering industry as a whole at September 21st was 282,333, representing a proportion of 27.8 per cent. (against 27.1 per cent. in August). In the electrical section the figure was 15.4 per cent. as compared with 15 per cent., the total being 13,863. There was a further slight decrease (from 14.9 to 14.7 per cent.) in the number of unemployed in the electric cable, wire and lamp manufacturing group, the total being 15,104, while in the electrical wiring and contracting industry the total of 3,522 represented an increase of from 18.2 to 19 per cent.

Electrical Imports of New Zealand

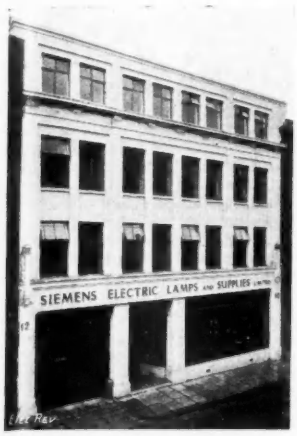
According to the *Board of Trade Journal*, the value of imports of electrical equipment into New Zealand during the June quarter totalled £374,460, as compared with £381,065 in the corresponding period of the preceding year. The United Kingdom was the largest supplier with a total of £233,703 (against £241,290), the United States being next with £65,783. The Australian share was £15,928, and the Canadian £20,312.

Foreign Enterprise in Spain

The Berlin A.E.G. announces that it has participated in the formation of the Geathom A.E.G.-Alsthom I.G.E. Co. (S.A.), Madrid, with a share capital of 20,000,000 pesetas, which is to be a sales company for high-pressure machinery. Besides the Berlin company, the Société Générale de Constructions Electriques et Mécaniques (Alsthom), of Paris, the Compagnie Française Thomson-Houston of Paris, the International General Electric Co., of New York and a Spanish group are also interested in the formation, the latter comprising the Iberica de Construcciones Electricas and the Iberica de Electricidad. These two latter companies already had relations with the A.E.G. and the Alsthom with the American General Electric Co. On the other hand, another German report states that the new company will be a producing undertaking which intends to be specially active in connection with the electrification of the Spanish railways as the Spanish Government requires the machinery to be constructed in the country and will not permit it to be imported. In addition to railway work the new company will also seek to play a part in the export trade, and a percentage of the export orders which may be obtained will be placed with the A.E.G. for execution. The latter is also stated to have taken up an interest in the General Electrica Spanola of Bilbao which has a share capital of 10,000,000 pesetas.

Siemens's Bristol Branch

The Bristol branch offices and stores of SIEMENS ELECTRIC LAMPS & SUPPLIES, LTD., in Bridge Street having proved inadequate, new commodious premises have been erected at 10 & 12, Marsh Street, to which the offices and stores were recently removed. The new building, which has four storeys, has an imposing entrance, and is flanked on one side by a large show window, enabling the company advantageously to display its products. On the other side of the entrance is a garage for housing the company's vans. The new premises will enable the company to carry larger stocks of lamps, batteries, cables, and domestic appliances. An idea of the size of the new building can be obtained from the accompanying reproduction of a photograph.



Siemens's New Bristol Branch

German Electrical Imports and Exports

The official returns recently to hand show that the value of imports of electrical machinery and apparatus into Germany during August last reached a total of £126,650, bringing up the aggregate imports during the first eight months of the year to £1,204,300, as compared with £1,368,100 in the corresponding period of 1930. The exports of similar material are returned at £1,941,450 for August last and £15,623,050 for the eight months, the latter figure comparing with £18,644,450 in the similar period a year ago. The import total was made up of electrical machinery (£242,900), and parts and apparatus (£961,400). The respective figures for the exports were £2,808,750 and £12,814,300.

Electrical Trade of Sweden

The imports of electrical machinery into Sweden during August, converted at the old rate of exchange, attained a value of £103,315, as compared with about £100,000 in the corresponding month of 1930. There was also a decline in the exports of electrical machinery during the same period, from £255,245 to £141,990.

New German Companies

Among the new concerns recently formed in Germany are the Westfälische Telefon Gesellschaft, Dortmund (78, Kaiserstrasse), capital £50,000, to manufacture and operate telephonic apparatus; the Phon-express Gesellschaft für Telephon Zusatzapparate, Berlin, the Siemens-Lurghi-Cottrell Electrofilter Gesellschaft für Forschung und Patent-verwertung, Berlin, £50,000; the Ultragen Gesellschaft für Strahlungstechnik, Hamburg, to manufacture violet-ray apparatus, mercury vapour lamps, etc.; and the Städtische Betriebswerke Mohrungen Gesellschaft, to take over the municipal electricity supply in the town of Mohrungen.

"Magicoal" Fires

On page 585 of our last issue we illustrated the "Wonderberry" fire produced by Berry's Electric, Ltd., but inadvertently referred to it in our notes as the "Newberry," one of the company's earlier models.

"R.I." Factory Extensions

Although the new factory of Radio Instruments, Ltd., at Purley Way, Croydon, was completed only just over a year ago, orders on hand have already compelled the company to carry out substantial extensions to its premises. Comprising three bays each of 30 feet wide, the additions adjoin the original building (described in the ELECTRICAL REVIEW of August 29th, 1930), and are to be seen on the right in the accompanying photograph. The premises now have a total frontage of 220 ft. on Purley Way, and the new bays provide accommodation for a further 250 employés, most of whom are engaged in transformer construction. The equipment of the extension includes 150 specially-designed winding machines made in the factory, each with a separate motor. Two sources of electricity are available, as it is found that machines driven by a.c. motors are more suitable for certain coils than d.c. motors. An exceptionally short time was taken to erect the new building. The contractors, Messrs. Bryce, Ltd. (a branch of the Hackbridge Electric Construction Co., Ltd.), who built the original works and offices, started work on the extension on August 14th, and by October 10th the building was erected and completed with electric lighting, power and heating equipments installed. It is proposed to carry out further extensions as required, as there is ample room on the site available for trebling the existing accommodation.

The New "R.I." Buildings

Rhymes of the Times

A Kipling-lover, well known in the electrical industry, has sent us the following verses:—

VIDE RUSSIA

(*With apologies to Rudyard Kipling.*)

When Capitalism's been shattered
And rushed to the very last root,
When all of the banks have been plundered
And everyone's shared in the loot,
We shall pause—p'rhaps a trifle belated—
And say, with a sad, hungry sob:
"We've done with the old rotten System—
Now we wonder who'll give us a Job."

And those who were hands shall be bosses,
They shall sit in the master's chair,
Although they've had nothing for breakfast
And damned nearly nothing to wear;
They will wander at will through the mansions
Where tyrants once thronged in the hall,
They will ring to have dinner at seven
But no one will answer their call.

And all of the people will suffer,
And all of the people will weep,
And no one shall work for money,
And no one shall sow or shall reap,
But each in his corner shall shiver
And think how much better they fare
With the System of All-Having-Nothing,
Than of Some-Having-More-Than-Their-Share.

New Catalogues and Lists

FERRANTI, LTD., Hollinwood, Lancs.—Leaflets Gb. 238 and W. 528, dealing respectively with multi-range d.c. test sets and valve testers. Reductions in prices in both cases are announced.

HEYES & Co., LTD., Water-Heyes Electrical Works, Wigan.—The October issue of the "Wigan Review," containing particulars of prismatic bulkhead fittings.

J. H. HOLMES & Co., Hebburn-on-Tyne.—A number of leaflets relating to electric motors, printing, welding and traffic-control equipment.

HAGUE & MCKENZIE, LTD., Pyramid Works, Sloane Street Parade, Birmingham.—A booklet illustrating "Pyramid" aluminium ware specially designed for use on electric cookers, hot-plates, etc.

The BRITISH PORCELAIN Co., LTD., Artillery Row, S.W.1.—A 377-page pocket catalogue (No. 409) of insulators, clamps, bus-bar supports, etc.

The PREMIER GAS ENGINE Co., LTD., Sandiacre, near Nottingham.—A leaflet containing a report of reliability trials on a "Crossley-Premier" horizontal 1,000-b.h.p. 8-cylinder vis-à-vis type heavy-oil engine.

The GENERAL ELECTRIC Co., LTD., Magnet House, Kingsway, W.C.2.—Particulars (Folder O.S. 5985) of a new range of Christmas tree and decoration lamp outfits.

The BENJAMIN ELECTRIC, LTD., Brantwood Works, Tariff Road, Tottenham, N.17.—The October issue of the "Reflector," containing articles on floodlighting and laundry lighting installations.

G. A. HARVEY & Co. (LONDON), LTD., Greenwich Metal Works, Woolwich Road, S.E.7.—A revised catalogue (No. 525) of "Harco" tanks, ventilators, steel furniture, and metal work generally.

J. A. CRABTREE & Co., LTD., Lincoln Works, Walsall.—An abridged price list (C.P.L. 146) of electrical accessories and switch- and fuse-gear. Also a leaflet dealing with iron-cased fuseboards.

TURNERS ASBESTOS CEMENT, LTD., Trafford Park, Manchester.—An illustrated booklet dealing with asbestos electrical insulation materials.

The ELECTRIC STREET LIGHTING APPARATUS Co., The Foundry, Canterbury.—A pamphlet illustrating some of the street lighting installations carried out by the company in London.

The BRITISH THOMSON-HOUSTON Co., LTD., Rugby.—A number of publications giving particulars of induction motors,

motor control panels, circuit-breakers, oil-break reversing contactors, photo-electric relays, over-current and reverse-current relays, etc.

FALK, STADELMANN & Co., LTD., 83-93, Farringdon Road, E.C.1.—The new season's catalogue (No. 653) of radio receivers and components.

JAMES GORDON & Co., LTD., Windsor House, Kingsway, W.C.2.—A leaflet illustrating and describing the "Igema" distance water level indicator.

The FOSTER INSTRUMENT Co., Letchworth, Herts.—The note in our last issue relating to the company's leaflet No. 53 should have read "Resilia" *spring* mounting and not pin mounting.

SIEMENS ELECTRIC LAMPS & SUPPLIES, LTD., 38-39, Upper Thames Street, E.C.4.—Catalogues Nos. 493 and Z.135, dealing respectively with "Xcel" domestic electrical appliances and low-tension fuse- and switch-gear, incorporating "Zed" fuses.

The MARCONIPHONE Co., LTD., 210-212, Tottenham Court Road, W.1.—Two catalogues relating to "Marconi" valves and the company's latest models of radio receivers, radio-gramophones and loud speakers.

C. H. PARSONS, LTD., Britannia Works, Wharfdale Road, Tyseley, Birmingham.—An illustrated pamphlet giving prices and particulars of "Britmac" electrical accessories.

EDWARD H. HERBERT, LTD., Atlas Works, Chapel Street, Levenshulme, Manchester.—A booklet containing hints on hack-sawing.

Trade Announcements

Messrs. W. T. HENLEY'S TELEGRAPH WORKS, Co., LTD., have opened a new stores depôt at 31-33, Gwyn Street, Bedford, under the managership of Mr. J. M. Faulkes. The telephone number is Bedford 3566, and the telegraphic address Henletel, Bedford.

Messrs. J. H. TUCKER & Co., LTD., have appointed Mr. W. C. Johnston, of 25, Eustace Steet, Dublin, as their agent in the Irish Free State.

Messrs. FENEMORE, HOWLETT & Co., LTD., have taken over the business recently carried on by Mr. Douglas Brown, Cranleigh, Surrey, as wireless, gramophone, and electrical contractor.

MR. DEREK BOULTON has opened an establishment in Market Place, Plymouth, as a radio and electrical engineer and specialist in house lighting installations.

The AYRSHIRE WIRELESS SERVICE, LTD., has opened premises at 15-17, Bank Street, Kilmarnock.

In the "New Companies" section of this issue we record the registration of the RELIANCE ELECTRICAL WIRE Co., LTD. We are informed that the whole of the shares in this new company have been issued to Messrs. W. Davis, 38-40, Curtain Road, E.C.2, and that the partners in this firm are the first directors. The registered office is at 29-31, Curtain Road, E.C.2.

Mr. R. K. Davies has joined his father in partnership, and the business is now carried on as Fred. W. Davies & Son, at Electrical Maintenance Works, Longroyd Bridge, Huddersfield.

Book Notices

"British Empire Trades Index, 1931-32." Pp. xxxiii+584. London: Business Dictionaries, Ltd. This is a directory specially compiled for manufacturers and merchants who desire to extend their connections within the Empire. It is divided into three sections. The first gives the names and addresses, together with the telephone numbers and cable addresses, of Empire traders under classified trades; the second is an alphabetical general index of the firms given in the first section; while the third is an alphabetical list of trade marks and brands of British Empire firms. The volume is to be issued annually in return for the cost of the postage.

"Protective Fittings for Insulator Strings." A report on tests carried out by Steatite & Porcelain Products, Ltd.

"Talking Pictures," by Bernard Brown. Pp. xi+305; figs. 161. London: Sir Isaac Pitman & Sons, Ltd. Price 12s. 6d. net.

We have received from the Aluminium Corporation, Ltd., an illustrated brochure describing briefly some of the most important improvements, the new rolling mills, etc., now completed at the company's works at Dolgarrog, North Wales.

Price Reductions

ELECTRIC RADIATORS, LTD., are reducing the prices of their electric irons and fires as from November 1st.

Recent Contracts

The Cawnpore Electric Supply Corporation has placed an order with SIMON-CARVES, LTD., for the complete boiler plant, and all auxiliaries, required in connection with an extension to the Cawnpore power station. The new plant will include a pulverised-fuel fired multiple-drum boiler, having an evaporative capacity of 65,000 to 85,000 lb. of steam per hour, with a steam pressure of 200 lb. per sq. in. at a temperature of 600 to 650 deg. F. The boiler plant will be complete with water-cooled combustion chamber, superheater, Foster economiser, and Simon-Carves "Unit" coal-pulverising plant.

MESSRS. HOPKINSONS, LTD., have received through their agent, Mr. Soren Hogh, of Copenhagen, the complete order for boiler mountings, including their new high-lift safety valves for eight Stirling boilers for the Copenhagen Municipal Lighting Department. The order also includes high-pressure valves for the pipe-lines. The more important main stop valves will be electrically operated. The value of the contract is approximately £20,000.

The new municipal baths at Watford, comprising a swimming bath (to be used as a concert hall in the winter), twenty slipper baths, foot baths, shower baths, and establishment laundry are to be electrically heated throughout. All the electrical equipment, including the electrode boilers, will be supplied by Messrs. BASTIAN & ALLEN, LTD., 26, Cross Street, London.

The New Zealand Radio Market

The Department of Overseas Trade has issued a supplement (Ref. A. 11147) to a circular issued last month relating to the import duties now payable on radio receiving sets and apparatus. For complete receiving sets mounted in cabinets the British preferential and general tariffs are respectively 10 and 35 per cent. *ad valorem*. No duty is payable on British radio components, but under the general tariff a 25 per cent. *ad valorem* duty is in force. In addition, a surtax of nine-fortieths of the duty is imposed, in the case of duty-free goods the surtax being 3 per cent. *ad valorem*.

For Sale

Exeter Electricity Committee invites tenders for the purchase and removal of motor convertors, a frequency changer, and a switchboard.

(See our advertisement pages to-day.)

Prices of Materials

Messrs. F. Smith & Co. report, October 21st, no change in the price of electrolytic copper and silicium bronze wire.

Messrs. Edward Till & Co. report, October 21st: India-rubber, Para fine, no change.

Messrs. James & Shakespeare report, October 21st: Copper bars (best selected), sheet and rod, no change. English pig lead, £14 15s., 5s. decrease.

Bankruptcy Proceedings

Bijou Portable Radio Co. (W. F. Hurry), Junction Road, Highgate, London, N.—The statutory first meeting of creditors was held on October 14th at the London Bankruptcy Buildings, the debtor having filed his petition on October 1st. The debtor states that he began business as a wireless set maker in October, 1928, with a capital of £50. Shortly afterwards he was joined in partnership by another person, who, however, remained with him for only eight months. The trading was fairly successful until about three months ago, when the business began to decline, and owing to pressure by creditors and a demand by the Marconi Company for royalties, he (debtor) filed his petition. Lack of capital is also stated as a cause of the failure. The liabilities are estimated at £379, against assets of £169. The estate was left in the hands of the Official Receiver.

J. E. Roberts (Roberts & Goldthorpe), engineer and electrician, Crosland Moor Mills, Huddersfield.—Receiving order made, October 13th, on debtor's own petition. First meeting, October 23rd, and public examination, December 9th, both at the County Court House, Queen Street, Huddersfield.

R. Dring, electrical engineer, 257, Freeman Street, Great Grimsby.—Second and final dividend of 1s. 3⅝d. in the £, payable November 2nd at the offices of Mr. C. Turner, 155, Norfolk Street, Sheffield.

Company Liquidations

World's Supplies (Manufacturers), Ltd., Church Road, Leyton, Essex.—Under the compulsory liquidation of this company the accounts show liabilities of £3,143, against assets of £597, and a deficiency of £3,497 with regard to contributories, the issued capital being 1,250 ordinary shares of £1 each. The Official Receiver, who is also acting as liquidator, states that the company was registered on October 31st, 1930, under the name of The World's Wireless (Manufacturers), Ltd., which was changed to the present title in January last. The objects of the company were to carry on the business of manufacturers and distributors of wireless apparatus generally. The sale of the company's products, which were mainly cheap portable wireless receivers, appears at first to have met with considerable success. The greater part of the receivers were sold under hire-purchase agreements by arrangements with finance companies, but owing to shortage of capital the company found it necessary to assign a large proportion of these agreements at a high discount, thus reducing the margin of profit which was already small. The receivers were also sold subject to a service agreement, and, owing to the use of cheap and indifferent parts, the costs of service were rather high. The failure of the company is attributed to the under-estimating of service costs, to excessive overhead expenses, to pilfering at the factory, and to lack of working capital.

Meeting of Creditors

Burndept Wireless (1928), Ltd., Aerial Works, Blackheath, London, S.E.—A notice has been issued by the secretary of the company convening a meeting of the creditors to-day (October 23rd), at Winchester House, Old Broad Street, London, E.C. In a circular which has also been issued it is stated "The directors have recommended to the shareholders that Mr. Edward Maloney, of the firm of Messrs. Peat, Marwick, Mitchell & Co., chartered accountants, should be appointed liquidator. This recommendation has the support of the largest creditors of the company, who have been approached by the directors in order to ascertain their views. Mr. Maloney has been acting as receiver for the debenture holders since February last, and has been in complete control of the company's assets, most of which have already been realised by him. Having regard to the proceeds of the assets already sold, and to the estimated value of the assets remaining, Mr. Maloney estimates that there should be a surplus available to meet the claims of the unsecured creditors to the extent of a few shillings in the pound, but this is dependent to a large extent upon the amount ultimately obtained from the sale of the company's factory at Blackheath."

Electricity Supply

Lighting, Domestic, Power

Argentina.—HYDRO-ELECTRIC DEVELOPMENT.—The *Review of the River Plate* states that in accordance with a concession granted by the Provisional Government on the River Yuspi, a co-operative hydro-electric station is to be erected at a distance of 10 km. from Cosquin (Cordoba) in order to supply the district with electricity for lighting and power purposes.

Australia.—SYDNEY.—The City Electricity Department reports that for the first seven months of this year the approximate total revenue of the Department was £127,333 less than the revenue for the corresponding period of 1930, but the working expenses were £40,034 lower. Development work has practically ceased for the time being and drastic staff reductions have accordingly been made. Many officers have left the service, but further dismissals are likely. At a recent meeting the Electricity Committee deferred for a fortnight the consideration of the recommendation of the general manager that the engagements of the resident and station engineers at Bunnerong power station should be terminated. The Pyrmont power station is to be closed indefinitely, necessitating further dismissals.

NYMBOIDA POWER SCHEME.—The Clarence River County Council has agreed to give a bulk supply of electricity from Nymboida to the Lismore Council at a cost of £500,000, thus making the total capital outlay on the Nymboida scheme approximately £800,000.

Bedford.—EXTENSIONS.—The Corporation Electricity Committee is to provide a supply of electricity to Old Warden and Southill at a cost of £3,140.

Brailsford (Derby).—REQUEST FOR SUPPLY.—The Parish Council has decided to apply to the Derbyshire and Nottinghamshire Electric Power Co. for an early supply of electricity, a canvass having shown that there are about 40 prospective consumers.

Brighton.—LOAN SANCTIONED.—The Corporation Electricity Committee has received sanction to a loan of £8,000 for domestic electrical apparatus.

Canada.—ELECTRICAL DEVELOPMENTS.—The new h.p. transmission line, 190 miles in length, constructed by the Ontario Hydro-Electric Power Commission, for supplying power to the Sudbury mining field has been completed and was put into operation on October 1st. The line extends from Hunta on the Canadian National Railway to Copper Cliff, near Sudbury. Under the agreement between the Commission and the Ontario Power Service Company a block of 16,000 h.p. was to have been delivered from the Abitibi Canyon development, but as it has been found impossible to complete this development until next year, the power company will in the meantime supply the commission with such power as it may require for the district (up to 25,000 h.p.) from the existing development of the Abitibi Power and Paper Company at Island Falls. The construction of the new line will stimulate the mining industries of the Sudbury district, and afford opportunities for manufacturing enterprises in northern Ontario.

Carlisle.—MAINS EXTENSIONS.—The Corporation has decided to carry out mains extensions in various districts at a cost of £627.

Colchester.—LOANS SANCTIONED.—The Town Council has received sanction to loans of £6,517 for the overhead line from Langenhoe to Tiptree, and £8,329 for the development of the Walton-on-Naze electricity undertaking.

Continental.—FRANCE.—Some interesting information regarding the electricity supply progress in the Paris area is given in the recently issued report of the Société de l'Union d'Electricité, which supplies about half of the power required by the Compagnie Parisienne de Distribution d'Electricité. The output from the company's plants, despite the industrial depression, increased from 1,004,975,000 kWh in 1929 to 1,402,031,000 kWh in 1930. During the year the initial plant of 100,000 kW was completed at the new Vitry power station where a second 100,000-kW set is now being installed. In view of the economic crisis, plans for further extensions at this station have been held up for the time being. At the Gennevilliers power station the work of replacing the old boilers with modern steam plant is rapidly progressing while steady advance is being made in the work of inter-connecting the various power stations in the Paris area and the hydro-electric plants in the central district of France by 60,000-V cables. Work has also been commenced on the erection of a 220,000-V line between Orleans and Paris, parallel to one which is being erected by the Paris-Orleans Railway Co., to draw power from the hydro-electric plants in the Massif Central area.

GERMANY.—A return just issued shows that the output of the 122 principal electric supply undertakings during July last amounted to 1,144,400,000 kWh, bringing the total for the first seven months of the year to 8,312,900,000 kWh, as compared with 9,415,000,000 kWh in the corresponding period of 1930.

SWEDEN.—In spite of the fact that the world-wide trade depression had already begun to make itself felt in Swedish economic life last year, there was an increase of 3 per cent. for the year in the production of electric power, the total rising from 4,967,000,000 kWh in 1929 to 5,117,000,000 kWh in 1930. The capacity of the generating stations in 1930 was 1,710,000 kVA. During the last five years the production of electricity has risen by about 40 per cent., by far the greater part (93 per cent.) of the total being generated by hydro-electric stations. The largest producer is the State, which owns six large hydro-electric stations and one important thermal station as a reserve; in 1930 nearly 32 per cent. of the total power was State-produced. Of the 5,117,000,000 kWh generated last year the large industries consumed 3,644,000,000 kWh, while 581,000,000 kWh was utilised for agriculture and the small industries and for lighting and household purposes. Electric railways and tramways accounted for 221,000,000 kWh. Among the stations put into operation in 1930 was the plant of the Sydsvenska Kraftaktiebolaget on the Karsefors rapids of the Lagan River in South Sweden, comprising two sets of 16,300 kW each. At Lanforsen on the Dalaelven River a station has been constructed by the town of Stockholm and other interests; two of the sets were started up in 1930 and the third in 1931, each of them being of 9,600 kW. This year the Uddeholms Aktiebolag has begun work on a new plant of 22,200 kW at Munkfors on the Klaraelven River in the province of Vaermland (West Sweden). In 1933 the opening is expected of the big Government-owned Vargoen plant on the Goeta river (20,100 kW), and about the beginning of 1936 the Kraangede station on the Indalsaelven (64,000 kW) and the Malfors station on the Motala River (20,700 kW) will be ready to start activity.—*Reuter's Trade Service* (Stockholm).

RUMANIA.—According to an article by Herr H. Thiess in a recent issue of *E.T.Z.*, although the industrial depression has caused a slowing-up, there has been a marked development in the extension of electric power supplies throughout Rumania in recent years. According to the figures given by the author, the number of public and private power plants in the country increased from 448 with a total capacity of 169,000 kW in 1929, to 451 and 184,800 kW at the end of last year. Most of the plants are, however, very small, the average installation being only about 410 kW. Of the total, 17 per cent. of the plants are hydro-electric, 51 per cent. are operated by steam and 32 per cent. by internal combustion engines. The aggregate output during last year amounted to 550 million kW, as against 570 million kW in 1929.

Ealing.—EXTENSIONS.—The Town Council has agreed to an application from Messrs. P. H. Edwards for a supply of electricity to houses about to be erected on the Park Royal Estate, Twyford Abbey. The borough electrical engineer has also been instructed to make necessary arrangements for the supply of electricity to two large blocks of flats being erected by Messrs. Percy Bilton (Inc.) between Hanger Lane and Lynwood Road.

Fort William.—POWER STATION EXTENSIONS.—Following the operations which the North British Aluminium Company is carrying out at Lochaber, it is proposed to double the size of the power house at Fort William. It is computed that when the whole works are completed it will be possible to generate 120,000 h.p. The contract for the work has been placed with Messrs. Balfour Beatty & Co., who carried out the first section. At present they have 1,000 men employed. The engineers are Messrs. C. S. Meik & Halcrow, London.

Gillingham (Kent).—ASSISTED WIRING SCHEME.—The Town Council has adopted a scheme submitted by the borough electrical engineer in connection with the assisted wiring scheme, based on the principle of a two-part tariff with a fixed charge of 20 per cent. on the rateable value of the premises, plus a " unit " charge of ¾d., the fixed charge to be reduced by five per cent. when capital and interest charges on the consumer's installation have been met. The system of wiring by contractors is to be continued.

Hamilton.—BULK SUPPLY.—The Corporation Electricity Committee is to make arrangements for obtaining a bulk supply of electricity from the Clyde Valley Electrical Power Co.

Hawick.—REQUESTS FOR SUPPLIES.—The Urban Electric Supply Co., Ltd., has received numerous inquiries from tenants of Council houses for supplies of electricity by means of its assisted wiring scheme and has asked the Town Council for permission to canvass the whole of the tenants. The Council is considering the matter.

Hay (Hereford).—PUBLIC LIGHTING.—The Urban District Council has accepted the tender of the Shropshire, Worcestershire and Staffordshire Electric Power Co. for public lighting.

Hazel Grove and Bramhall.—LOANS SANCTIONED.—The Urban District Council has received sanction to a loan of £7,000 for mains and services, meters, and consumers' wiring installations.

Hollingbourne (Kent).—SUPPLY TO BREDHURST.—Having received requests for electricity from residents at Bredhurst, the Rural District Council has decided to ask the Gillingham Town Council to give a supply, subject to the consent of the Kent Electric Power Co. Bredhurst is in the latter's area of supply, but there appears to be no likelihood of the company's extending its mains to the parish for some time.

Hull.—LOAN SANCTIONED.—The Corporation Electricity Committee has received sanction to a loan of £100,000 for mains and services.

Irish Free State.—LIGHTING OF MENTAL HOSPITAL.—The Committee of Management of the Mental Hospital at Mullingar has decided to have electric lighting installed in the Institution by the Electricity Supply Board.

CLAREMORRIS AND BALLYHAUNIS.—The Electricity Supply Board has refused to consider the extension of transmission lines from Claremorris to Ballyhaunis unless £3,000, half the cost, is forthcoming locally. Mr. Fitzgerald-Kenney, K.C., Minister for Justice, is negotiating on behalf of the towns.

Liverpool.—ELECTRICAL INSTALLATION AT INSTITUTION.—Mr. P. J. Robinson, the city electrical engineer, has prepared a scheme, which has been accepted by the Port Sanitary and Hospitals Committee, for the installation of electricity throughout the Belmont Road Institution, at a cost of £3,850.

London.—ISLINGTON.—The Borough Council Electricity Committee has voted £3,000 for the rental wiring scheme and £1,000 for the hire-purchase scheme.

STOKE NEWINGTON.—The Borough Council Finance Committee recommends that application be made for sanction to loans of £5,000 for meters, £10,000 for mains and services and £5,000 for free wiring installations.

SHOREDITCH.—The Borough Council Housing Committee is to install electricity in fifty flats on the Whitmore estate at a cost of £950.

ST. PANCRAS.—The Borough Council Finance Committee recommends that application should be made for sanction to the borrowing of £6,637 for services, £3,433 for meters, £6,620 for consumers' wiring installations for hire and £3,898 for domestic apparatus for hire. Sanction has been received to a loan of £1,974 for the provision of a l.p. feeder. Mains extensions costing £531 are recommended by the Electricity and Public Lighting Committee.

FULHAM.—The Borough Council Electricity and Lighting Committee recommends that radiators not exceeding 2 kW in capacity, and other standard electrical apparatus should be hired out to offices and business premises at the charges prescribed for domestic consumers. Application is to be made for sanction to the borrowing of £17,500 in connection with the rental wiring schemes.

BATTERSEA.—The Borough Council Electricity Committee recommends that the two-part tariff shall be altered so that the fixed charge shall be based on the floor space of the premises supplied instead of on the rateable value. The Electricity Committee is to provide electricity for 305 premises at a cost of £2,664, and replace with armoured cable old vulcanised vitumen distributors at a cost of £5,874.

SOUTHWARK.—The title of the Electric Light Committee has been changed to the "Electricity Committee." Electricity is to be installed at further flats on the Hartnoll and Manor estates at a cost of £2,500.

Manchester.—LOAN SANCTIONED.—The Corporation Electricity Committee has obtained sanction to the borrowing of £18,200 for mains and transformer stations.

ELECTRICAL EQUIPMENT FOR SANATORIA.—The Public Health Committee intends to provide electrical equipment at Abergele Sanatorium at a cost of £1,110, and an electric truck for the Withington Institution at a cost of £208.

Morecambe.—LOAN SANCTIONED.—The Corporation Electricity Committee has received sanction to the borrowing of £2,500 for mains, services and plant.

Motherwell.—YEAR'S WORKING.—Mr. W. D. Brassington, borough electrical engineer, in his annual report on the operation of the electricity undertaking states that although 376 new consumers were connected, electricity sold amounted to only 9,495,569 kWh, a decrease of 295,364 kWh as compared with the preceding year. There was a marked advance in the use of domestic apparatus, the increase in cooker installations over last year's total amounting to 30 per cent. The total income from all sources was £65,150, the gross profit being £15,908.

Nottingham.—REVISED ELECTRICITY CHARGES.—The Corporation Electricity Committee recommends the introduction of a new domestic tariff with a fixed charge based on the rateable value of the premises supplied and a "unit" charge of ½d. per kWh. The Committee also recommends that the meter rent should be abolished and that a minimum charge of 5s. per quarter should be made to each consumer not consuming 5s. worth of electricity.

Okehampton.—CHEAPER ELECTRICITY.—The West Devon Electricity Supply Co. has informed the Rural District Council that it is proposed to run main transmission lines from Okehampton to North Tawton, and that when the supply is available the charge for electricity in Okehampton will be reduced from 10d. to 9d. per kWh.

Oswestry.—LOANS SANCTIONED.—The Town Council has received sanction to the borrowing of £6,037 for mains and services, £1,782 for sub-station equipment, £618 for meters and £1,000 for works in connection with the change-over in the system of supply.

Price Reductions.—Reductions in the charges for electricity have been made or recommended in the following districts:—

BLACKPOOL.—Power for traction: A reduction of $\frac{1}{10}$d. per kWh.

WEYBRIDGE.—Lighting flat rate: From 8d. to 6d. per kWh. A two-part tariff for domestic, business, and power purposes is also to be introduced.

Rothesay.—PROPOSED NEW PLANT.—At a recent meeting the Corporation Electricity Committee considered a report by Mr. Windeler, the expert appointed to investigate the vibration at the power station. The Committee instructed Mr. Windeler to obtain information regarding the cost of new generating plant.

St. Helens.—LOANS.—The Town Council has received sanction to a loan of £20,000 for mains extensions. Application has also been made for permission to borrow £1,884 for e.h.p. feeder mains, a kiosk, and switchgear for the Eccleston housing estate.

South Africa.—GRAHAMSTOWN.—The City Council has decided to ask the ratepayers for power to approach the Provincial Administrator with a view to raising a loan of £34,000 for the erection of a new power house and for generating plant. This is made necessary by the increasing demand for electricity for domestic purposes.

South-West England.—ELECTRICAL ACTIVITIES.—It is understood that when the South Wales area has been dealt with the Electricity Commissioners are to turn their attention to the electrification of the South-West. Officials of the Central Electricity Board have been busy in Devon and Cornwall for some time with regard to sites, wayleaves and other matters of detail. A contract has been executed by the Commissioners for the purchase of a site of two and a half acres at St. Thomas, Exeter, where one of the important sub-stations of the scheme is to be erected.

Southend-on-Sea.—YEAR'S WORKING.—In spite of increased revenue (£227,120, as against £216,755 in 1929-30), the Corporation Electricity Department (engineer: Mr. A. C. Johnson) showed a reduction of £1,086 in working expenditure (£125,607). The gross profit advanced from £90,063 to £101,513, and to it was added £54,908 (credit balance from the previous year's account) and £1,931 (income from miscellaneous sources), making a total of £158,352 available. After making provision for capital and other charges there remained a credit balance of £53,139, of which £5,000 was appropriated for the relief of the rates. During the year £105,865 was spent on capital account, the chief items being £73,298 for mains and services, and £18,463 for machinery. Increased consumption of electricity was recorded in all sections, the total sold amounting to 18,990,109 kWh, as compared with 17,535,440 kWh in the previous year. The maximum demand increased from 8,533 to 9,506 kW, and the number of consumers from 23,273 to 24,415.

South Lincolnshire.—EXTENSIONS.—The Boston & District Electric Supply Co., Ltd. is extending its supply system to the villages of Wigtoft, Bicker and Swineshead. Supplies are also to be given en route to a number of hamlets, and a further extension will shortly be carried out to supply the village of Whaplode in the East Elloe rural district, by means of a 3,000-V line from Holbeach. The whole of the overhead and underground transmission lines, together with the necessary transformers and switchgear, are being supplied and erected by the National Electric Construction Co., Ltd.

Steyning (Sussex).—SUPPLY IN LANCING.—The Rural District Council has decided to make representations to the Shoreham & District Electric Light Co., Ltd., regarding the need for the provision of additional electric lighting facilities in the parish of Lancing, and to request the company to arrange for the mains to be extended accordingly.

Straits Settlements.—SINGAPORE.—We have received from Mr. E. W. P. Fulcher, municipal electrical engineer, a copy of his report on the operation of the Electricity Department for the year 1930. The total quantity of electricity sold for all purposes was 26,135,192 kWh, an increase of 3,466,476 kWh over the previous year's figure, and—contrary to recent experiences in this country—the greatest part of this increase (2,594,876 kWh) was due to a rise in consumption for power purposes. The total revenue increased from $2,385,875 to $2,616,767 (dollar=2s. 4d.), while the working expenditure amounted to $913,358, as compared with $861,669. There was a gross profit of $1,703,408 ($1,524,205), and a net profit of $243,616 ($202,943). The average price obtained per kWh was 9.761 cents, as against 10.371 cents in 1929. New consumers numbered 1,552, bringing the total connected to 15,771.

Swinton and Pendlebury.—NEW SHOWROOMS AND OFFICES.—The Urban District Council has decided to purchase premises for conversion into electricity showrooms and offices.

Thornton-Cleveleys.—METERS.—The Urban District Council has received sanction to the borrowing of £1,000 for the purchase of meters.

Tilbury.—WIRING OF HOUSES.—The Housing Committee of the Urban District Council has received sanction to a loan of £5,052 for wiring houses for electric lighting.

Wakefield.—LOAN FOR METERS.—The Corporation Electricity Committee is to apply for sanction to a loan of £5,000 for meters.

ASSISTED WIRING.—The borough electrical engineer is to interview the Electricity Commissioners on the question of financing expenditure in connection with hire-purchase wiring.

Watford.—SUPPLY TO MUNDEN AND HANSTEADS.—The Corporation Electricity Committee has asked the electrical engineer to report with regard to supplying electricity to Munden and Hansteads.

ECONOMISERS.—The Electricity Committee has voted an expenditure of £1,000 for economisers for two boilers.

Worthing.—NEW ELECTRICITY SHOWROOMS.—The Town Council has decided to lease premises in the town for use as electricity showrooms.

Traction

Carlisle.—TRAMWAY ABANDONMENT.—The town clerk has reported to the General Purposes Committee that the arrangements with regard to the abandonment of the tramway system and the substitution of omnibuses by the Ribble Company have been completed.

Continental.—SWEDEN.—The Railway Board has informed the Government of its wishes with regard to allowances in the next Budget. The Board says that it has made efforts to act in conformity with the Government's appeal for economy. The largest allowance asked for is for the continuation of electrification work on the main line between Stockholm and Malmoe and certain connecting lines. For this purpose, Kr. 21,100,000 will be needed during the next financial year, in conformity with the construction programme approved by the last Riksdag. Only Kr. 19,600,000 of this amount can be raised by Budget allowances, the rest being taken from the State Railways' renewal fund. With regard to new constructions, the Board asks for an allowance of Kr. 4,000,000 to continue work on the so-called inland railway, and Kr. 1,000,000 to continue work on a small line between Malung and Vansbro in Dalecarlia. The total amount requested for new plant, safety contrivances, etc., is only Kr. 3,291,000. This amount includes expenditure on changing over from telegraph to telephone between the stations in the southern and central parts of the country.—*Reuter's Trade Service* (*Stockholm*).

RUSSIA.—It is reported that a Russian commission is expected to arrive in Berlin to enter into negotiations in regard to the allocation of orders for the equipment of the proposed underground railway in Moscow and the rendering of technical assistance in the matter.

FRANCE.—As a result of the satisfactory results obtained by accumulator traction vehicles put in service in 1927, the Compagnie des Chemins de Fer Economiques des Charentes, which operates about 230 miles of metre-gauge local railways, has recently purchased an additional ten vehicles of this type.

BELGIUM.—An electric railway has just been completed and opened for traffic between Brussels and the suburb of Tervueren. Including the terminals there are only four stations on the line, which is operated by d.c. at 1,500 V.

Japan.—NEW ELECTRIC RAILWAY.—The Tokyo Seihoku Electric Railway Co. is to start work shortly on the construction of a new electric railway, 29 km. in length, between Nishi-Sugamo, near Toyko, to Koshin-Machi. The total cost of the line will be about 3,000,000 yen.

London.—PROPOSED LIGHT SIGNALS FOR BOND STREET.—The Ministry of Transport has submitted to the Westminster City Council a scheme for the introduction of electric traffic control signals in Bond Street.

PICCADILLY TUBE EXTENSION.—Excellent progress has been made with the extension of the Piccadilly tube railway from Finsbury Park to Cockfosters, a distance of 7½ miles, and it is probable that the first part, from Finsbury Park to Arnos Grove, will be opened by Whitsuntide next year. The remainder, from Arnos Grove through Enfield West to Cockfosters, will be opened a few months later. Meanwhile 275 cars, slightly longer than the existing coaches, are being built at Birmingham and Gloucester. The total cost of the new line will be £5,300,000, exclusive of other Underground improvements and extensions in hand, which will cost a further £6,700,000.

Manchester.—TUBE SCHEME ABANDONED.—At a meeting held on Tuesday last the Underground Railway Committee decided to abandon for the present the scheme for connecting up Victoria and Oxford Road Stations by means of an underground railway.

Newcastle-upon-Tyne.—TRAMWAY ABANDONMENT.—The Corporation Transport and Electricity Committee has decided to substitute 'buses for trams on the Osborne Road service.

South Africa.—PORT ELIZABETH.—The City Council has appointed a special sub-committee to consider the question of introducing automatic traffic control systems in the city.

Southport.—ADMINISTRATION.—*Modern Transport* states that Mr. A. R. Fearnley, general manager of Sheffield Corporation Tramway Dept., has been asked to report and advise on the administration of the Southport Corporation tramway and omnibus undertaking. The co-ordination of trams and buses is one of the principal matters which will engage his attention.

Telegraph and Telephone

East Africa.—REDUCED CABLE RATES.—Imperial & International Communications, Ltd., announce the reduction of rates charged for cablegrams from the United Kingdom to Kenya, Uganda, Zanzibar, and Tanganyika Territory.

Egypt.—TELEPHONE REVENUE.—The total revenue of the State telephone service between May 1st and September 20th reached £E. 277,000, showing a decline of £E. 13,000. The income of the telegraph service amounted to £E. 62,000, being a decrease of £E. 18,000 as compared with the same period in 1930.

India.—TELEGRAPH RATES.—An increase of five annas per rupee in the rates of all foreign telegrams has been decided upon by the Government of India. The change is due, it is explained, to the fact that the tariff on such telegrams is fixed in gold francs. The Indian rupee being no longer on a gold basis, India has suffered under the existing rates.—*Reuter* (Simla).

International Telephony.—BULGARIA.—Long-distance telephone communication has lately been re-established between Sofia (Bulgaria), Stamboul (Turkey) and Angora (Asia Minor). Arrangements are also in hand for the establishment of a connection between Sofia on the one hand and Salonica and Athens, Greece, on the other.

Italy.—SUBMARINE TELEPHONE CABLES.—The Ministry of Communications has given instructions for the laying of a new submarine cable for telephony and limited high-speed telegraphy between Sardinia and the mainland (about 120 miles). Italy now ranks fourth among nations possessing submarine cables, already owning nearly 19,000 kilometres of submarine lines; another 1,150 kilometres is being laid, including the Sardinia line, and authority has been given for 9,650 kilometres.—*Reuter's Trade Service* (Rome).

Palestine.—LONG-DISTANCE TELEPHONY.—It is proposed to build a telephone line between Syria and Palestine, via Haifa, next year. The French authorities have drawn up a report on the project and have submitted it to a Franco-British Committee with a view to determining how the cost of the line is to be shared. The circuit may eventually be extended to Egypt.

Photo-telegraphy.—ITALY-UNITED STATES SERVICE.—A new picture telegraphy service between Italy and the United States of America has been opened and will be operated via London and the transatlantic section of the wireless circuits of Imperial and International Communications, Ltd.

Poland.—AUTOMATIC TELEPHONY.—All the Polish telephones are to be converted from manual to automatic operation, at a cost of £500,000. The contract has been secured by the Telephone & General Trust Co., Ltd. This company is associated with the Automatic Telephone Manufacturing Co., Ltd., which is making all the new switchboards, instruments, and other requisite apparatus.

The Dutch East Indies.—The Dutch East Indies now have direct radio-telephone communication with four countries, with eight countries via Holland, with ten via Germany and via Holland and Great Britain with four countries.

Radio

Australia.—BROADCASTING IN TASMANIA.—The Post Office Department is conducting a series of experiments with the object of devising equipment which will enable programmes broadcast on the mainland to be transmitted to Tasmania for relaying from the Hobart station. Owing to the limited population the revenue available in Tasmania is insufficient to provide a satisfactory service.

NEW STATION.—A new B-class station is being built at Perth, West Australia, by Amalgamated Wireless, Ltd. It will be known as 6PR and will work on a wavelength of 341 metres with an unmodulated aerial power of 200 watts.

France.—NEW STATION.—The Radio-Paris 85-kW transmitter at Essarts-le-Roi is expected to commence operating shortly, and the power of another Paris station (Ecole Supérieure, P.T.T.) will probably be increased. The Post and Telegraph Administration also intends to build a new high-power station in Corsica.

Licences.—Since the P.O. detector vans commenced touring London to identify unauthorised listeners the number of new receiving licences purchased has totalled 82,000 in London alone, and 110,000 throughout the country.

This year 385 unlicensed users of receiving sets have been prosecuted and the maximum fine of £5 imposed in all but one case. Apart from the 26,216 licences which have been issued free to blind persons, 272,000 new ones were sold during September, but 185,525 listeners allowed theirs to lapse, the net increase for the month thus being 86,475, raising the total to 3,930,577.

Loud-speaker By-law.—LONDON.—The St. Marylebone Corporation's General Purposes Committee is preparing, in consultation with the Home Office, a by-law to prevent the public use of radio loud-speakers and gramophones in such a manner as to cause annoyance. Complaints of such nuisance within the Borough have increased of late.

Radio Exchange.—BLACKBURN.—Mr. John Walsh, electrician, has applied to Blackburn Town Council for permission to inaugurate a relay wireless service. The application has been deferred until January next, when the whole subject will be reviewed by the Corporation.

Rome.—INTERNATIONAL CONFERENCE.—A conference of the International Broadcasting Union commenced at Rome on October 19th and is expected to last throughout this week.

U.S.A.—COLLEGE STATIONS.—Broadcasting stations are used by 41 institutions of higher learning as integral parts of their educational systems. Transmitting time varies from one to 53½ hours per week each, the cost of operation and maintenance being usually met by appropriations from State and Educational Extension Depts. Some of the stations are now, however, accepting sponsored programmes, says *World-Radio*.

Contract Information

When "Contracts Open" are advertised in our "Official Notice" pages the date of the "Electrical Review" containing the advertisement is given in parentheses below

Contracts Open

Australia.—MELBOURNE.—December 1st. Post and Telegraph Department. Condensers. (A.X. 11111.)*
January 4th.—Paper and varnished cambric insulated, lead covered, steel wire armoured cable. (A.X. 11127.)*

Barking.—October 27th. Electricity Department. Sub-station switchgear and two 250-kVA transformers. (October 16th.)

Bradford.—November 7th. Tramways Committee. Twelve months' supply of general stores, including electrical fittings for tramcars and insulating materials. Particulars from the tramways general manager, 11, Forster Square.

Cheadle and Gatley.—November 10th. Electricity Department. A 250-kVA transformer switch and distributor kiosk sub-station. (October 16th.)

Czecho-Slovakia.—PRAGUE.—November 30th. Elektrické Podniky (Electrical Enterprises). Underground cables. (See this issue.)

Dublin.—November 9th. Dublin United Tramways Co. (1896), Ltd. Twelve months' supply of general stores, including electric lamps and fittings. Particulars from the company's offices, 59, Upper O'Connell Street, Dublin.

Dundee.—November 2nd. Corporation. Lifts at the new municipal offices, City Square. Conditions of contract, &c., from the official quantity surveyor, 91, Commercial Street.

Egypt.—CAIRO.—November 4th. Ministry of Public Works. Electric fans. (A.X. 11130.)*
November 14th. Ministry of the Interior. H.p. and l.p. underground distribution system, including transformers and kiosks, for Mansourah. (A.X. 11136.)*
December 22nd. Electric power station for the town of Fikria. (A.X. 11140.)*

Farnworth.—October 28th. Electricity Department. L.p. cables. (See this issue.)

Glasgow.—October 28th. Corporation. Electric lighting installation for Balmore Road housing scheme. Specifications, &c., from the general manager, Electricity Department, 4, West Regent Street, C.2.
October 31st. Public Assistance Department. Stores (including electrical fittings) for various institutions under its control. Specifications from the Contracts Department, 266, George Street.

Horsham.—October 27th. Electricity Department. Rotary convertor equipment or, alternatively, mercury arc rectifier equipment. (October 9th.)

India.—NEW DELHI.—January 7th. Indian Stores Department. A.c. and d.c. ceiling fans. (A.X. 11116.)*
November 16th. Copper conductors. (G.X. 10826.)*

Kidderminster.—November 7th. Worcestershire Public Assistance Committee. Installation of electric lighting and power at the Poor Law Institution. Specification (deposit £5 5s.) from Messrs. Moffet, Rosher & Mann, consulting engineers, Union Chambers, Temple Row, Birmingham.

London.—OFFICE OF WORKS.—November 2nd. Electric bell material. (See this issue.)

Manchester.—November 2nd. Electricity Committee. Coal conveyor and coal-handling plant. (See this issue.)

New Zealand.—WELLINGTON.—December 18th. New Zealand Railways. Armoured cables and junction boxes. (A.X. 11122.)*
January 18th. Railway overhead equipment. (G.X. 10792.)*
February 29th. Three automatic railway sub-stations. (A.X. 11105.)*
November 21st. Post and Telegraph Department. Dial cords. (A. 11121.)*
November 26th. Connection strips. (A. 11120.)*
November 30th. Moulded telephone cases. (A. 11119.)*
December 7th. 6,800 galvanised earth rods. (G.X. 10829.)*
December 8th. 2,000 carbon diaphragms. (A. 11131.)*
December 8th. 200 head receivers. (A. 11133.)*
December 15th. Public Works Department. 50-kV oil-immersed circuit breakers for Arapuni. (A.X. 11118.)*

Northern Ireland.— November 16th. Electricity Board. 3½ miles of 132-kV and 33-kV four-circuit overhead transmission line. (October 9th.)

Perth.—October 31st. Corporation. Various works, including electric lighting in 226 houses at Edinburgh Road, Friarton. Schedules, etc. (deposit £1), from Mr. T. McLaren, burgh surveyor and housing director.

Rumania.—BUCHAREST.—November 2nd. Municipal Waterworks. Electric motors and pumps for waterworks at Grosavesti. (G.X. 10822.)*

*Further particulars can be obtained at the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, S.W.1.

Contracts Closed

Bromley (Kent).—Town Council. Accepted:—
Erecting and wiring lamp standards and apparatus for centre suspension electric lighting in streets (£374).—G. W. Gosling.

Eastbourne.—Electricity Committee. Recommended:—
Transmission lines in parts of the rural districts of Eastbourne and Hailsham (£15,784).—Pirelli-General Cable Works, Ltd.

Ellesmere (Salop).—Urban District Council. Accepted:—
Electrically driven compressor and ejector plant for the sewage disposal works (£705).—Daniel Adamson & Co. Ltd.

Gainsborough.—Urban District Council. Accepted:—
Wiring the Town Hall for electric lighting (£95).—W. B. Redfern.

Government Contracts.—The following contracts were placed by the various Government Departments during September:—

ADMIRALTY (CONTRACT AND PURCHASE DEPARTMENT).
Coolers for main motors.—Metropolitan-Vickers Electrical Co., Ltd.
Dynamometer.—Heenan & Froude, Ltd.
Motor-generator sets.—Crompton Parkinson, Ltd.
Steam-driven generator sets.—Matthew Paul & Co., Ltd.
Welding resistances and e.h.p. switchgear.—Allen West and Co., Ltd.
E.h.p. switchgear.—Crompton Parkinson, Ltd.

WAR OFFICE.
Crude oil engine generating set.—W. H. Allen, Sons & Co., Ltd.
Meters.—Reason Manufacturing Co., Ltd.; Measurement, Ltd.
Headgear receivers.—S. G. Brown, Ltd.
Directing motor switches.—Small Electric Motors, Ltd.

AIR MINISTRY.
Ammeters.—Park Royal Engineering Co., Ltd.
Voltmeters.—Everett, Edgcumbe & Co., Ltd.

CROWN AGENTS FOR THE COLONIES.
Cable.—British Insulated Cables, Ltd.
Telephone repeaters.—General Electric Co., Ltd.

POST OFFICE.
Protective apparatus.—Siemens Bros. & Co., Ltd.
Telephonic apparatus.—Automatic Telephone Mfg. Co., Ltd.; Ericsson Telephones, Ltd.; G.E.C., Ltd.; B. W. Johnson; Phœnix Telephone & Electric Works, Ltd.; Siemens Bros. & Co., Ltd.; Standard Telephones and Cables, Ltd.; Telephone Mfg. Co. (1929), Ltd.
Cable.—B.I. Cables, Ltd.; Connollys (Blackley), Ltd.; Enfield Cable Works, Ltd.; Hackbridge Cable Co., Ltd.; Henley's; Standard Telephones & Cables, Ltd.
Reconditioning cable.—Telegraph Construction & Maintenance Co., Ltd.
Leclanché cells.—Atlas Carbon & Battery Co.; Every-Ready Co.; Fuller Accumulator Co., Ltd.; G.E.C.; Siemens Bros. & Co., Ltd.
Secondary cells.—Chloride Electrical Storage Co., Ltd.; Edison Swan Electric Co., Ltd.; Hart Accumulator Co., Ltd.
Loading coils.—Siemens Bros. & Co., Ltd.
Condensers.—Condenser & Electric Co.
Telephone cords.—London Electric Wire Co. & Smiths, Ltd.; L.P.S. Electrical Co.
Milliampère meters.—E. Turner.
Charging panels.—Power Equipment Co.
Wall plugs.—G.E.C.
Telegraph steel poles.—British Mannesman Tube Co.
Teleprinters.—Creed & Co.
Switchboard wire.—B.I. Cables; Henley's.
Telephone exchange equipment.—
"Daily News" (E.C.).—Relay Automatic Telephone Co., Ltd.
Acocks Green (Birmingham), Elmbridge (Surrey).—Ericsson Telephones, Ltd.
Sloan, S.W., Welbeck, W., Temple Bar, W.C., Fulham, Bermondsey.—Standard Telephones & Cables, Ltd.
Kensington.—G.E.C.
Ashstead.—Automatic Telephone Mfg. Co., Ltd.
Gerrard (Whitehall second unit).—Siemens Bros. & Co., Ltd.

Glasgow.—Education Committee. Recommended:—
Electric lighting at Balmore school (£238).—D. A. M'Larty and Co.
Transport Committee. Recommended:—
Sluice type conveyor at Pinkston power station (£5,311).—Underfeed Stoker Co., Ltd.
Housing Committee. Recommended:—
Electrical installation in houses in Carntyne housing scheme (£136).—R. J. McIntyre.

Great Yarmouth.—Education Committee. Accepted:—
Electric lighting replacements and additions at Northgate girls' school and Nelson school (£105).—R. H. Haylett.

Lamp Contracts.—The Admiralty has placed a further contract with Siemens Electric Lamps and Supplies, Ltd., for a supply of gasfilled lamps.

Liverpool.—Corporation Health Committee. Accepted:—
Two electrically-driven pumping outfits (£167).—J. Wolstenholme & Son, Ltd.
Watch Committee. Accepted:—
Component parts for automatic traffic signals to March 31st, 1932.—Automatic Telephone Manufacturing Co., Ltd.

London.—LONDON COUNTY COUNCIL.—Highways Committee. Accepted:—
Pipework and de-superheating plant, etc., at Greenwich power station (£27,946).—Vickers-Armstrongs, Ltd.
Electrically-driven circulating water pumps, etc. (£4,714).—Drysdale & Co., Ltd.
Stores and Contracts Committee. Accepted:—
Two electric goods lifts (£1,520).—Wm. Wadsworth & Sons, Ltd.
Housing Committee. Accepted:—
Electrical installation, Levita House, Ossulston estate (£1,475).—City Electrical Co.

FULHAM.—Electricity and Lighting Committee. Recommended:—
Wiring of tenements on the Swan Brewery site (£3,452).—Kershaws (Electrical Engineers), Ltd.
Wiring of staircases and yards at Swan Brewery estate (£342).—G. Hill.

Newcastle-upon-Tyne.—Education Committee. Accepted:—
Installation of electric lighting at the North Heaton Council Schools (£221) and the Sandyford Road School (£178).—Simms & Richardson.

Northern Ireland.—Electricity Board. Accepted:—
Sub-station transformers.—Ferranti, Ltd.
Sub-station l.p. switch and fuse boards and kiosks.—General Electric Co., Ltd.
L.p. distribution in Comber and Newtownards.—Fraser and Borthwick.

Sherburn Hill (Durham).—Parish Council. Accepted:—
Electric lighting of streets at the new Council houses.—Reid Ferens & Co.

South Africa.—CAPE TOWN.—Electricity Committee. Recommended:—
Two 15-kW motor-generator sets (£225) and two 1-kW sets (£68). — F. W. Searle (for Crompton Parkinson machines).
Plugs for hire-purchase ranges (£1,750).—C. E. Scott, Ltd.
1,000 meters.—Associated Engineers Co., Ltd.
Cut-outs.—British Insulated Cables, Ltd. (£966); Siemens Bros., Ltd. (£123).

Worsley.—Rural District Council. Accepted:—
Electrical work in 320 houses.—S. Dickinson, Ltd.

Forthcoming Events

Institution of Mechanical Engineers.—Friday, October 23rd. Institution, London. 6 p.m. Presidential address. Lieut.-Col. E. Kitson Clark.

Birmingham Electric Club.—Friday, October 23rd. Grand Hotel, Birmingham. 7 p.m. "A Discussion on A.C. Motor Performance and Application." Mr. E. W. Walker.

Faraday House Old Students' Association.—Friday, October 23rd. Savoy Hotel, W.C. Annual dinner.

Institution of Electrical Engineers.—Monday, October 26th. Institution, London. 7 p.m. Informal meeting. Discussion on "Is the Engineer given his due share in Management?" Opened by the President. (*North-Eastern Centre.*)—Monday, October 26th. Armstrong College, Newcastle-upon-Tyne. 7 p.m. Chairman's address. Mr. A. G. Shearer. (*North-Midland Centre*).—Wednesday, October 28th. Hotel Metropole, Leeds. 7 p.m. Chairman's address. Mr. R. G. Ward. (*East-Midland Sub-Centre*).—Tuesday, October 27th. The College of Technology, Leicester. 6.45 p.m. "The Use of Nickel in the Electrical Industry." Mr. A. B. Everest. (*London Students' Section*).—Friday, October 30th. Institution, London. 6.15 p.m. "The Business of Electrical Apparatus Manufacture." Mr. G. Shaw and Mr. G. A. M. Hyde.

Electrical Association for Women.—Tuesday, October 27th. E.L.M.A. Lighting Service Bureau, London. 3 p.m. "By Air to Baghdad, Babylon, and Ur." Mrs. Pender Chalmers.

Institution of Engineers and Shipbuilders in Scotland.—Tuesday, October 27th. Institution, Glasgow. 7.30 p.m. "Time Study in Engineering." Mr. Sam Mavor.

Paisley Association of Electrical Engineers.—Tuesday, October 27th. Y.M.C.A. Board Room, Paisley. 7.30 p.m. Faraday Centenary lecture. Mr. W. R. Bruce.

Illuminating Engineering Society.—Friday, October 30th. Royal Society of Arts, London. 6.30 p.m. Discussion on "Some Impressions of the I.I.C. Floodlighting." Opened by Mr. P. Good.

Junior Institution of Engineers.—Friday, October 30th. Institution, London. 7.30 p.m. "Automatic Combustion Control." Mr. S. J. Clifton.

Institute of Marine Engineers.—Friday, October 30th. Hotel Victoria, London. Annual conversazione.

Association of Supervising Electrical Engineers.—Saturday, October 31st. Visit to Metropolitan Cable Works, Chadwell Heath.

Our Service Department

Inquiries must be accompanied by a stamped addressed envelope.

We shall be glad to learn the name and address of the makers of the following:—

SUPREMUS eliminators and mains units.
SYLVIA shades.
FICO electric iron.

Notes

Electrical Association for Women

On October 15th the North Staffordshire branch held its first meeting of the autumn session, when Mr. F. Gurney, of the Metropolitan-Vickers Electrical Co., Ltd., lectured on "Advertising." After briefly tracing the history of the uses of advertisement, the lecturer proceeded to deal with his subject under three main headings: poster advertising; circular and Press advertising, and newspaper advertising. As evidence of the extent to which advertisement is carried on to-day, Mr. Gurney stated that upwards of £150,000,000 is estimated to be spent on advertising annually. The lecturer then proceeded to deal with the advantages of the different methods of advertising, and outlined the essential features of a good advertisement. A number of advertisements for various products were displayed and their chief features dealt with, while special attention was paid to the question of advertisements for electricity supply and electrical apparatus.

A New Element

The discovery of a new element, the eighty-seventh in the scale, between radon and radium, is announced by Dr. Jacob Papish, professor of spectroscopy at Cornell University, U.S.A. It was found in the lustrous velvet-black mineral known as samarskite, which is worth about 8s. 6d. per lb. It is calculated that two million parts of samarskite contain one part of the new element, which is an insoluble solid and cannot be isolated because of its inflammability.

Appointments Vacant

Assistant engineer for Spalding Urban District Council Electricity Department.

Graduate assistant in electrical engineering for Wolverhampton and Staffordshire Technical College.

Shift charge engineer for Beckenham Urban Council.

(See our advertisement pages to-day.)

Nuclear Physics Congress

The first annual International Congress on Nuclear Physics, assembled in Rome by the Fondazione Alessandro Volta, was inaugurated on October 11th by the Marchese Marconi, president of the Royal Italian Academy. The delegates, numbering about fifty, included seven Nobel Prize winners, some of the foremost atomic physicists, and Professors F. W. Aston, C. D. Ellis, and R. H. Fowler, of Cambridge, Prof. D. S. Townsend, of Oxford, and Sir John A. Fleming. Prof. Corbino, Rome University, said that in the domain of physics mankind was on the eve of discoveries as momentous as the discovery of fire.

Liverpool Electro-Harmonic Society

The first concert of the eighth season of the Liverpool Electro-Harmonic Society will be held on October 23rd at the Carlton Restaurant, Liverpool. There will be three smoking concerts and two other events held during the season.

I.E.E. Scottish Centre

The annual dinner of the Scottish Centre of the Institution of Electrical Engineers will be held on November 24th at the Grosvenor Restaurant, Gordon Street, Glasgow (6.30 for 7 p.m.). Tickets, 17s. 6d. each, can be obtained from Mr. R. B. Mitchell, c/o honorary secretary, 74, Waterloo Street, Glasgow.

Lamp Standardisation

During the course of a lecture (the second of the Faraday Illumination Design Course) delivered at the E.L.M.A. Lighting Service Bureau last Monday evening, Mr. L. E. Buckell gave the three main characteristics of a lamp as: (1) light output; (2) consumption of electricity; and (3) life, which was the least important, as it was no criterion of quality, since, if electricity was dear it would pay to use a lamp with a life of only 300 or 400 hours.

World standardisation had resulted in the production of a lamp with high efficiency, good average life, good appearance, and having no damaging effect on eyesight. During the last fifteen years there had been a reduction in price of 75 per cent.

In 1921, 8.1 lumens per watt could be obtained from a 100-watt lamp; by 1931 this had increased to 10.7 lumens per watt. In the case of the 60-watt lamp there was an increase from 7.6 to 9.1 lumens per watt. This 25 per cent. increase of light output represented a gift of £2,500,000 a year to the light-using public, for, if we assumed a lighting consumption of 800 million kWh a year at an average price of 3d. per kWh, this amounted to £10,000,000 spent on lighting annually. The public paid no less, but it used more light.

The increase in the use of lamps had been more rapid of late years in this country (which was very far from having the highest-priced lamps) than in any other. When the Lighting Service Bureau started its work the consumption of lamps in Great Britain was about 0.65 per head of population; now it was practically a lamp per head.

The two-part tariff had helped the lighting load to an unsuspected extent, as where electricity could be obtained cheaply people were not going to worry as to the cost of good lighting.

Dealing in some detail with the B.E.S.A. Specification, the speaker pointed out that modern lamps kept up their light throughout one thousand hours to an average of 95 per cent. Ten years ago in designing a lighting installation one added 25 per cent. for depreciation of lamps, and another 25 per cent. for depreciation of fittings. Now only a 10 per cent. allowance was necessary, provided the lamps were changed every 1,000 hours. The custom of regularly changing lamps was to be encouraged. All the lamps on the Embankment, for example, were changed every 800 hours.

A Large Synchronous Condenser

For use in its Crawford Avenue station, the Commonwealth Edison Company of Chicago has placed an order with the Westinghouse Co. for what is stated to be the largest synchronous condenser ever made, it being reported that the machine will exceed by 50 per cent. the capacity of any existing synchronous condenser. When installed, the machine with its auxiliaries will be 45 ft. long and 20 ft. wide, and it will weigh 400 tons. The condenser will have a rating of 75 000 kVA, and the cost will be approximately $250,000. The auxiliaries consist of a directly connected starting motor and high-speed excitation equipment. The purpose of the machine is to provide the voltage and power factor regulation necessary to obtain the maximum capacity of a 220-kV transmission line.

Our Personal Column

Electrical men are invited to enable us to keep readers of the "Electrical Review" posted concerning their movements

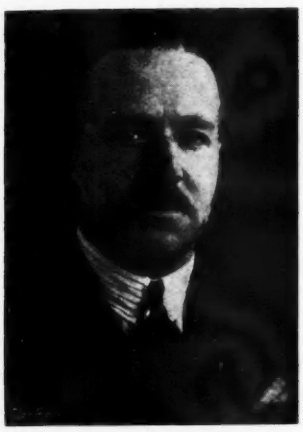
At the inaugural meeting of the Western Centre of the Institution of Electrical Engineers at Cardiff on October 12th, Mr. S. B. Haslam presented an illuminated address to **Mr. C. T. Allan,** who recently retired from the position of Honorary Secretary of the Centre, after holding the office for 16 years.

Mr. P. H. S. Kempton, of Messrs. W. H. Allen, Sons & Co., Ltd., has been elected President of the Bedford Scientific & Engineering Society for the 1931-32 session.

Mr. H. Marryat is to present an oil painting of the late Dr. S. Z. de Ferranti to the Institution of Electrical Engineers at the ordinary meeting on November 5th. The portrait has been painted by Mr. David Jagger, R.A.

Mr. C. A. Phillips, of the technical staff of Brookhirst Switchgear, Ltd., who was married on October 5th, was presented by his colleagues with a barometer.

Mr. J. Entwistle, for many years the Manager of the Birmingham branch of Standard Telephones & Cables, Ltd., has taken up an appointment with Messrs. H. J. Baldwin & Co. Mr. Entwistle has always taken a keen interest in electrical matters in the Midlands, and this year is president-elect of the Birmingham Electric Club. His new activities commence forthwith, and while he will still be resident in Birmingham, his duties will embrace a much larger field than hitherto, bringing him once again into contact with Lancashire, and particularly Manchester, where his name will be associated with the Western Electric Co. His early training was received with the Manchester Electricity Supply Dept., under the guidance of Dr. S. L. Pearce, and at the Manchester School of Technology. At the outbreak of the war he obtained a commission in the Lancashire Fusiliers, and he served in France almost continuously until the Armistice.



Mr. J. Entwistle

Mr. R. N. Lomax, Junior, has terminated his appointment with Messrs. H. J. Baldwin & Co. as district representative for the Lancashire, Cheshire, North Wales and Yorkshire area. His address is "Fairhaven," Macclesfield Road, Hazel Grove, Cheshire.

Mr. Thomas Henwood, who recently retired, after 34 years' service, from the position of mains superintendent at the Brighton electricity works, was presented by Mr. W. N. C. Clinch, on behalf of the Electricity Department, with a portable wireless set at the annual dinner of the Recreation Club, held on Friday last.

Mr. W. Phoenix, who has been on the staff of the Warrington Corporation Electricity Department since 1920, has been appointed by the Newton-in-Makerfield Urban District Council to the position of engineer and manager of its electricity undertaking.

Mr. W. R. Montgomery, a director and the manager of the Alton Battery Co., Ltd., has been re-elected chairman of the Alton and District Chamber of Commerce, an office to which he was appointed twelve months ago.

Mr. A. H. Parker, late of the Harland Engineering Co., has joined Messrs. Drake & Gorham, Ltd., as sales manager for the North of England, for the company's e.h.p. and l.p. switchgear and electric pumping equipment. Mr. Parker will be at the company's Manchester office.

Of the forty-four applications for the appointment of chief electrical engineer and manager of the St. Pancras electricity undertaking, the following names have been submitted to the Borough Council: **Mr. R. Lee,** borough electrical engineer and manager at Stockport, **Mr. W. Dundas,** deputy city electrical engineer, Bradford, and **Mr. V. A. Pask,** deputy general manager and engineer of the Newcastle and District Electric Lighting Co., Ltd.

Mr. H. T. Young was presented on Tuesday last with the Leon Gaster Memorial Premium for his paper on "Modern Domestic Lighting." The premium is administered by the Illuminating Engineering Society as a memorial to its late secretary and this is the first award.

Mr. A. G. Balfour, who relinquished his position as general manager of the tramways of the Llandudno and Colwyn Bay Electric Railway, Ltd., in July last, has been presented with an inscribed oak smoking cabinet by the staff of the company.

According to statements appearing in the newspaper Press, Associated Electrical Industries is introducing a number of changes for the purpose of reducing administrative expenditure. The office of managing director is being discontinued, and **Sir Philip Nash** is vacating that office and the chairmanship of the Metropolitan-Vickers Electrical Co., Ltd. Sir Philip will continue on the board of the latter company, of which Sir Felix Pole is chairman.

It was announced at a meeting of the Institute of Fuel, held on October 20th, that the Council of the Institute had awarded the Melchett Medal for the current year to **Prof. W. A. Bone,** F.R.S., of the Department of Fuel Technology at the Imperial College of Science. The medal will be presented to Prof. Bone on January 27th next, when he will deliver the Melchett Lecture.

Mr. H. C. Lamb has again accepted the presidency of the Manchester Electro-Harmonic Society for the ensuing season.

Mr. W. E. Warrilow has retired from the assistant managership of Edison Storage Battery Distributors, Ltd., owing to the present economic situation. He expects to make an announcement shortly regarding his future activities, and asks that in the meantime communications should be addressed to him at Amber Way, Nancy Down, Oxhey, Herts ("Watford 4092.") On leaving the Edison Company he was presented by his colleagues with a fountain pen desk set as a mark of two and a half years' association.

Obituary

Mr. T. Aitchison, one of the pioneers in electricity in the North of England, died last week. Mr. Aitchison in conjunction with the first Lord Armstrong, then Sir William Armstrong, was responsible for the electrical installation at Cragside, Rothbury, Northumberland, about sixty years ago. This was one of the first electrical installations in the north. The first experiment in outside lighting by electricity was also made by the late Lord Armstrong and Mr. Aitchison when the grounds of Cragside were lit with coloured lights on the occasion of the visit of King Edward VII.

Mr. F. Leach.—The death occurred on October 4th, at the age of 43 years, of Mr. Frank Leach, proprietor of the East Midland Electrical Co., Lincoln.

Professor Fritz Foerster.—The death is reported from Dresden, at the age of 66 years, of Prof. Dr. Ing. Fritz Foerster, who had been connected with the Dresden Technical High School for the past thirty-one years. The deceased was one of the leading German authorities in the field of electro- and physical-chemistry research and also on the properties of insulating materials.

Sir James McKechnie.—The death is reported of Sir James McKechnie, formerly managing director of Vickers, Ltd. He was also a director of Vickers-Petters, Ltd., and Centrifugal Separators, Ltd.

Dr. S. W. Stratton.—It is reported that Dr. Samuel W. Stratton, chairman of the Massachusetts Institute of Technology, died suddenly on October 18th. Dr. Stratton was a close friend of the late Mr. T. A. Edison, and assisted him in some of his work.

Wills.—Sir Hugh Bell, chairman of Dorman, Long & Co., left £264,909 (net personalty £67,636).

Mr. T. Casey, late representative of the Indo-European Telegraph Co., Teheran, left £19,925 (net £19,877).

The Manchester Electro-Harmonic Society

This society commenced its thirteenth season on October 16th. In the unavoidable absence of the president, Mr. H. C. Lamb, the chair was taken by the past-president, Mr. J. A. Robertson, and one of the usual high-class concerts was provided. From the attendance at this first meeting, it would appear that the membership is being maintained in numbers, and that the Society continues to thrive.

The venue of the meeting has been altered, the Committee having secured accommodation in the Waldorf Hotel, Cooper Street, Manchester. Dates of subsequent meetings of the Society are: November 20th, December 18th, January 15th, February 19th, March 18th. It has been decided that the Ladies' Evening shall be held on January 30th in the main hall of the "Manchester Limited" restaurant. This takes the place of a dinner-dance, and it is expected that this function will be on the lines of the highly successful Ladies' Evenings which have been a feature of the Society for the last three or four years. Inter visits are again being arranged between the Manchester and Liverpool clubs, and it is felt that these social gatherings are very effective aids to promoting good fellowship between the electrical and allied trades in the two towns. Particulars regarding the activities of the Society can be obtained from Mr. C. E. Leak, secretary, 10-12, Cateaton Street, Manchester, by either intending members, or visitors.

Financial Section

New Companies, Returns of Share Capital, Debenture Charges, Reports of Electrical Companies, Dividend Changes, Transactions in Stocks and Shares

New Companies Registered

Gravesend Radio Central Exchange, Ltd.—Registered October 10th. Capital, £5,000 in 4,500 preference shares of £1 each and 10,000 ordinary shares of 1s. each. Objects: To acquire from Radio Central Exchanges, Ltd., the benefit of the consent of the Gravesend Borough Council to the placing of wires for the purpose of a broadcast relay service over streets in Gravesend, to establish, maintain, control and regulate services for the relaying of radio programmes, &c. The directors are:—A. B. Winch, Broomhall, Broadbridge Heath, Sussex (director Radio Central Exchanges, Ltd.), and W. T. Whaley, Granville House, Byfleet, Surrey (managing director of Radio Central Exchanges, Ltd.). Registered office: 37, Walbrook, E.C.4.

Ilco, Ltd.—Private company. Registered October 17th. Capital, £2,000 in £1 shares. Objects: To carry on the business of manufacturers of and dealers in electric and wireless batteries, radio instruments, refrigerating apparatus, &c. The directors are:—H. J. Butterfield, 304, Woodstock Road, Oxford, and H. S. Critchley, 1, Moreton Road, Oxford. Registered office, 22, George Street, Oxford.

Reliability Stores, Ltd.—Private company. Registered October 12th. Capital, £750 in £1 shares. Objects: To acquire the business of radio dealers lately carried on by A. S. Bull at 99, Blatchington Road, Hove, as "The Reliability Stores." The directors are:—A. S. Bull, 99, Blatchington Road, Hove, and S. Mounter, 39, Lawrence Road, Hove. Secretary, S. Mounter. Registered office: 99, Blatchington Road, Hove, Sussex.

H. G. Wharton, Ltd.—Private company. Registered October 12th. Capital, £500 in £1 shares. Objects: To carry on the business of manufacturers and repairers of, agents for and dealers in motor and electrical parts, apparatus, accumulators, dynamos, &c. The subscribers are:—F. Smith and Beatrice Coton, both of 58, Gladsmuir Road, Highgate, N.19. The directors are:—H. G. Wharton (permanent director and chairman) and Elizabeth A. L. Wharton, addresses not stated. Secretary, F. Smith. Registered office: 58, Gladsmuir Road, Highgate, N.19.

Alliance Automobiles, Ltd.—Private company. Registered October 10th. Capital, £100 in 100 ordinary shares of £1 each. Objects: To carry on the business of manufacturers of and dealers in radio receiving and transmitting sets, radio gramophones, &c. The subscribers are:—G. H. R. Tildesley, Vernon House, Bloomsbury Square, W.C.1, and F. P. Daniell, Rushden, Sunnymeads, Wraysbury. G. H. R. Tildesley is life director and chairman. Acting secretary: G. H. R. Tildesley. Registered office: Vernon House, Bloomsbury Square, W.C.1.

Robert M. Russell, Ltd.—Private company. Registered in Edinburgh on October 9th. Capital £10,000 in £1 shares. Objects: To carry on the business of electrical, mechanical, consulting, contracting and general engineers, etc. The subscribers are:—R. M. Russell, 4, River Road, Carmyle, Glasgow, E.2; and H. Brechin, 34, West George Street, Glasgow. R. M. Russell is the first director. Registered office: 4, River Road, Carmyle, Glasgow, E.2.

Acton Battery Co., Ltd.—Private company. Registered October 9th. Capital £750 in £1 shares. Objects: To carry on the business of manufacturers of and dealers in all kinds of dry and wet electric batteries, accumulators, etc. The directors are:—L. A. Manser and Maud C. Manser, both of 8, Woodland Rise, Muswell Hill, N.10. Registered office: 229, Acton Lane, W.4.

Herne Bay Relay Services, Ltd.—Private company. Registered October 10th. Capital £4,000 in 2,500 preference shares of £1 each and 30,000 ordinary shares of 1s. each. Objects: To establish and maintain stations for the reception or distribution of wireless signals, etc. The first directors are:—J. E. Ball and Mrs. C. L. Ball, both of 1, First Avenue, Clacton-on-Sea. Registered office: Brooklyn, Canterbury Road, Herne Bay.

Cold Metal Spraying Co., Ltd.—Private company. Registered October 15th. Nominal capital £100 in £1 shares. Objects: To carry on business as specialists in the cold spraying of metal for electrical conductivity on non-conductive materials, etc. The directors are:—P. Wheeler, 82, Portland Place, W. (director of Metropolitan Cammell Carriage Wagon and Finance Co., Ltd., Associated Equipment Co., Ltd., and V. H. Jackson & Co., Ltd.); and A. E. Lawton, 48, St. Peters Road, Croydon (director of V. H. Jackson & Co., Ltd.). Registered office: 1, Carteret Street, Westminster, S.W.1.

Marten & Vergette, Ltd.—Private company. Registered October 14th. Capital £600 in £1 shares. Objects: To acquire the business of radio and electrical dealers and engineers, carried on by J. E. Marten and J. D. Vergette, as "Marten & Vergette" at 412, Ewell Road, Tolworth, Surbiton. The first directors are:—J. E. Marten, 38, Castellain Mansions, Maida Vale, W.9; and J. D. Vergette, 17, Oakdene Drive, Tolworth. Secretary: H. C. Mundy. Registered office: 412, Ewell Road, Tolworth, Surbiton.

Reliance Electrical Wire Co., Ltd.—Private company. Registered October 14th. Capital £100 in £1 shares. Objects: To carry on the business of manufacturers of and dealers in electric wires, cords and cables, etc. The directors are:—L. Davis (chairman and permanent director), 40, Chatsworth Road, Brondesbury, N.W.6; and H. Davis. 23, St. Stephen's Gardens, St. Margarets, Middlesex.

Oakes & Liversage, Ltd.—Private company. Registered October 14th. Capital £1,500 in £1 shares. Objects: To acquire the business of electrical contractors and radio and automobile engineers, hitherto carried on by G. H. Oakes and P. L. Liversage at 2, Jenkin Street, Burslem, Stoke-on-Trent. The directors are:—G. H. Oakes, 2, Jenkin Street, Burslem, Stoke-on-Trent; and P. L. Liversage, 43, Price Street, Burslem, Stoke-on-Trent. Solicitors: R. Heaton & Son, Wedgwood Chambers, Burslem.

Ipswich Wireless Co., Ltd.—Private company. Registered October 14th. Capital £1,000 in £1 shares. Objects: To carry on the business of manufacturers, importers and exporters of, agents for and dealers in radio apparatus, cabinets, loud-speakers, etc. The permanent directors are:—C. D. Hazell, 116, Freehold Road, Ipswich; and A. Adcock, 39, Fore Street, Ipswich. Secretary: Agnes M. Hazell. Registered office: 46, Westgate Street, Ipswich.

Diathermic Rays, Ltd.—Private company. Registered October 14th. Capital £5,000 in 4,000 5 per cent. preference and 1,000 ordinary shares of £1 each. Objects: To carry on the business of manufacturers of and agents for all kinds of electrical apparatus, exploiters of various electrical apparatus of service to medical science, etc. The directors are:—G. T. P. Yeoman, 114, Fordwych Road, Hampstead, N.W.2; and A. C. Elliott, 27, Craven Terrace, Lancaster Gate, W.2. Secretary: W. Bronson. Registered office: 4, North End Road, Golders Green, N.W.11.

Refrigerator Components, Ltd.—Private company. Registered October 13th. Capital £100 in £1 shares. Objects: To carry on the business of manufacturers of and dealers in refrigerators, components or parts, ice-making machinery, oil burners and electrical apparatus, etc. The first directors are:—F. W. Morgan, 16, Allen Mansions, Allen Street, W.8; and L. J. Wolf, Oakwood, South Drive, Ruislip (both directors of Wolf and Morgan, Ltd.). Registered office: 66, Victoria Street, S.W.1.

Returns of Electrical Companies

Edward Wilcox & Co., Ltd.—Capital, £2,000 in 1,000 preference and 1,000 ordinary shares of £1 each. Return dated September 9th. 600 preference and 1,000 ordinary shares taken up. £1,163 7s. 6d. paid (being £1 per share on 600 preference and 501 ordinary and 2s. 6d. per share on 499 ordinary). Mortgages and charges, nil.

Electrical Contracts & Maintenance Co. (1925), Ltd.—Capital, £3,000 in £1 shares. Return dated April 10th, 1931. 2,405 shares taken up. £2,405 paid. Mortgages and charges, nil.

Cleveland and Durham Electric Power, Ltd.—Capital, £700,000 in 350,000 preference and 350,000 ordinary shares of £1. Return dated April 1st, 1931. All shares taken up. £619,698 paid on 348,230 preference and 271,468 ordinary shares. £80,302 considered as paid on 1,770 preference and 78,532 ordinary shares. Mortgages and charges, nil.

Northern Counties Electricity Supply Co., Ltd.—Capital, £200,000 in £1 shares. Return dated April 1st, 1931. 194,201 shares taken up. £190,201 paid on 190,201 shares, £4,000 considered as paid on 4,000 shares. Mortgages and charges at date of return: £187,347 (since paid off).

Central Electrical Co. (Nottingham), Ltd.—Capital, £5,500 in 5,000 preference shares of £1 and 10,000 ordinary shares of 1s. each. Return dated December 24th, 1930 (filed May 19th, 1931). 2,501 preference and 10,000 ordinary shares taken up. £2,501 paid on the preference shares, £500 considered as paid on the ordinary shares. Mortgages and charges, nil.

British Radio Valve Service, Ltd.—Capital, £10,000 in 4,000 preference and 6,000 ordinary shares of £1 each. Return dated December 31st, 1930 (filed May 13th, 1931). 2,000 preference and 6,000 ordinary shares taken up. £3,000 paid on 2,000 preference and 1,000 ordinary shares, £5,000 considered as paid on 5,000 ordinary shares. Mortgages and charges: £500.

Harvey-Perkins, Ltd. (formerly Palmer-Perkins, Ltd.).—C. E. Lucas, of Warwick Road, Coventry, ceased to act as receiver on September 28th.

Walsh & Stevenson, Ltd.—T. Hayes, incorporated accountant, of 13, Greek Street, Leeds, was appointed receiver and manager on October 1st, under powers contained in debenture dated October 7th, 1930.

Electric and General Industrial Trusts, Ltd.—Issue on October 9th of £1,250 debentures, part of a series already registered.

Æonic Radio, Ltd.—D. L. Honeyman, of 9, Basinghall Street, E.C.2, ceased to act as receiver and manager of the freehold factory and cottages on August 13th, 1931.

Torquay Tramways Co., Ltd.—Satisfaction to the extent of £1,900 on September 30th, of trust deed dated March 8th, 1911, and registered March 15th, 1911. (According to the register of mortgages, the trust deed registered March 15th, 1911, originally secured £60,000 prior lien debentures.)

Kitson's Insulations, Ltd.—Capital £7,500 in 5,000 preference shares of £1 and 5,000 ordinary shares of 10s. Return dated November 27th, 1930 (filed June 4th, 1931). 5,000 ordinary shares taken up. £1 paid. £2,489 considered as paid. Mortgages and charges: £5,000.

Thames Valley Electric Supply Co., Ltd.—Capital £50,000 in £ 1shares. Return dated April 30th, 1931. All shares taken up. £50,000 paid. Mortgages and charges: nil.

Newmarket Electric Light Co., Ltd.—Capital £30,000 in £10 shares. Return dated April 15th, 1931. 2,656 shares taken up. £26,560 paid. Mortgages and charges: £14,200.

Folkestone Electricity Supply Co., Ltd.—Capital £237,500 in 175,000 ordinary, 50,000 preference, and 12,500 employés' copartnership shares of £1 each. Return dated April 7th, 1931. All shares taken up. £200,000 paid. £37,500 considered as paid. Mortgages and charges: £99,100.

Marconi International Marine Communication Co., Ltd.—Capital £1,500,000 in £1 shares. Return dated April 6th, 1931. 1,192,726 shares taken up. £1,087,726 paid. £105,000 considered as paid. Mortgages and charges: £100.

British Insulated Cables, Ltd.—Capital, £2,666,666 in 500,000 "A" 5½ per cent. preference, 500,000 6 per cent. preference, and 1,666,666 ordinary shares of £1 each. Return dated April 3rd, 1931. All shares taken up. £2,239,341 paid on 500,000 "A" preference, 372,350 6 per cent. preference, and 1,366,991 ordinary shares. £427,3325 considered as paid on 127,650 6 per cent. preference and 299,675 ordinary shares. Mortgages and charges: £700,000.

Lancashire Dynamo & Motor Co., Ltd.—Capital, £320,000 in 60,000 preference and 260,000 ordinary shares of £1 each. Return dated April 7th, 1931. All shares taken up. £320,000 paid. Mortgages and charges: £75,000.

General Installation Co., Ltd.—Debenture dated October 1st, to secure £100, charged on the company's undertaking and property, present and future, including uncalled capital. Holder: R. Q. Thompson, 9, Parkland Road, Streatham, S.W.16.

Lewis Thomas & Sons, Ltd.—Satisfaction on September 29th, of two mortgages or charges (one collateral) dated January 5th, 1927, and registered January 13th, 1927, securing £1,000.

San Luis (Mexico) Tramways, Ltd.—T. Ford, of 37/41, Gracechurch Street, E.C.3, and A. C. W. Dermer, of 24, Martin Lane, Cannon Street, E.C.4, were appointed joint receivers on October 6th under powers contained in trust deed dated July 15th, 1912.

Symondsbury Electric Lighting Co., Ltd.—Capital £2,000 in £5 shares. Return dated May 26th, 1931. 244 shares taken up. £1,220 paid. Mortgages and charges: nil.

North Wales Power Co., Ltd.—Deed of security dated October 2nd, to secure £206,000 charged on land and company's undertaking and property, including any uncalled capital. Holder: Solicitor for H.M. Treasury.

Lymington Electric Light & Power Co., Ltd.—Capital, £50,000 in 8,600 ordinary and 1,400 preference shares of £5 each. Return dated April 29th, 1931. 7,200 ordinary and 1,285 preference shares taken up. £42,425 paid. Mortgages and charges, nil.

City Notes

Eros Electric Lamp Co., Ltd., came before the public with a prospectus advertised in some of the morning and evening newspapers at the end of last week. The list was to close on or before October 20th (Tuesday last). The offer comprised 80,000 8 per cent. participating cumulative preference shares of £1 each and 200,000 ordinary shares of 2s. each, making altogether £100,000. The company is purchasing a factory at Willesden for £13,750 and will take over from the vendors (O. W. Songest, C. F. Hendrick, and H. A. Jager) a contract under which they will supply to the New Synergy Co., Ltd., "at a remunerative price for a term of ten years a minimum supply of 1,500,000 electric lamps per annum." There is also a contract under which the vendors sell to Thanet, Ltd., "at a remunerative price for a term of four years a minimum supply of 500,000 electric lamps per annum." Mr. O. W. Songest, who is described as an electrical expert of twenty-six years' experience in the industry and a member of the Advisory Committee of the London and Home Counties Joint Electricity Authority, is managing director of the company under a ten years' agreement, at £1,000 per annum. After paying £13,750 for the factory, purchasing the machinery, plant and installation for £14,000, and paying vendors' consideration for the lamp contracts mentioned and the option to purchase the factory (£14,000, as to £4,000 in cash and £10,000 in ordinary shares), also preliminary expenses, £40,000 will remain as working capital. The prospectus estimates a net trading profit during "the first trading year" of £33,328. It states: "In May, 1931, the patent in connection with the gas-filled electric lamps expired, thus leaving an almost unlimited field of activity." It is stated that the machinery is being installed; that the company has arranged to employ a highly skilled staff; and that the Willesden district will yield suitable labour which will be speedily trained into capable operatives; also that the factory when in full production will turn out 5,000,000 lamps per annum. An agreement having been entered into whereby any unsubscribed shares of the issue were to be purchased, the directors were to go to allotment on the closing of the lists.

The Electro Trust, Ltd., reports a total revenue of £21,717 for the year ended June 30th last, as against £23,300 for the preceding year. The net revenue was £14,011, and the directors recommend a dividend of 4 per cent. on the ordinary shares, less tax, and the placing of £1,500 to reserve, leaving £7,531 to be carried forward.

At the annual meeting on October 19th, Mr. H. S. H. Guinness (chairman), who presided, said in the course of his speech that the reduction in revenue was partly due to the fact that an investment in a Spanish electricity undertaking which had been revenue producing was disposed of at a profit in May, 1930, but no interest was received on the proceeds of the sale. The revenue during the current year was coming in well and was in excess of that received for the corresponding period of last year. Industries which could still claim to be immune from the effects of world depression were few, but the electrical industry was one of them. The output of electricity in this country by all authorised undertakers for the year ended December 31st last increased by 5.6 per cent. and it was particularly interesting to note that in the case of every undertaking the total sales to domestic consumers and for the purpose of trade and petty industry had advanced, even in areas hardest hit by the crisis. The report and accounts were adopted.

The British Electric Traction Co., Ltd., has sent a circular to the holders of its deferred ordinary stock recalling that at the last annual meeting it was proposed to create a certain amount of debenture stock and divide it among the deferred holders in the proportion of £5 debenture stock for every £1 of deferred stock held by them. The debenture stock was to carry a low rate of interest, but be accompanied by a comparatively heavy sinking fund so as to redeem the stock as quickly as possible. It was stated that if the scheme met with general approval it was intended to put it before the stockholders in a concrete form during this autumn. The present times, however, are so peculiar it is doubted whether a scheme which was obviously to the advantage of the stockholders a few months ago is equally attractive to-day, and the directors have therefore decided to postpone any further consideration of the matter until the end of the financial year of the company (March 31st, 1932). This decision is not due to anything which has happened to the company itself, but solely to external events. The additional income tax will naturally diminish receipts to some extent, but "the stockholders may rest assured that the directors will do their best at the end of the financial year to deal with the available income in the way which will give the greatest satisfaction to the stockholders."

Herbert Morris, Ltd., report that after providing £24,744 for depreciation, there is a profit of £9,811 for the year ended July 31st, as compared with £48,593 for the preceding year. The report states that the demand for the company's manufactures has been restricted, especially in overseas markets, and for much of the business available it was necessary to accept very low prices. The preference dividend is paid, but no ordinary dividend is proposed (against 10 per cent.). After adding £10,000 (same) to reserve, it is proposed to carry forward the balance of £37,010 (against £51,849). The crane business of Messrs. Craker Bros. (Manchester), Ltd., was acquired during the year.

The Norwich Electric Tramways Co. reports a net profit to June 30th last of £26,831, as compared with £24,180 in the preceding year, which with £388 brought forward makes £27,219 available. It is proposed to transfer £12,500 to reserve, and to pay a final dividend of 2½ per cent., subject to tax, making 5 per cent. for the year (same), and to carry forward £1,519.

The Victoria Falls and Transvaal Power Co., Ltd., reports net earnings for the quarter ended June 30th, before providing for British and South African taxation, of £328,110, as compared with £325,810 for the corresponding period of 1930.

The Cornwall Power Co. announces that owing to the continued low price of tin, mines which have hitherto provided the main income of the company, remain closed, with the result that the directors are unable to pay the half-yearly preference dividend due this month.

The Calcutta Electric Supply Corporation, Ltd., has declared an interim dividend on the ordinary share capital of 5 per cent., less tax at 2s. 6d.

The River Plate Electricity Co., Ltd., has declared an interim dividend of 3 per cent.

The Shanghai Electric Construction Co., Ltd., has announced an interim dividend of 5 per cent., tax free (same).

The Cawnpore Electric Supply Corporation, Ltd., has declared an interim dividend of 3 per cent. (same).

The Adelaide Electric Supply Co., Ltd., has announced a final dividend of 4½ per cent., tax free, on the ordinary shares, making 8½ per cent., tax free, for the year (against 12 per cent.).

Stocks and Shares

TUESDAY EVENING.

THE Stock Exchange markets are looking forward with satisfaction to the probable result of the General Election. The amount of business actually transacted in the popular markets is still small in proportion to the rises secured. The political expectations are responsible for improvements in most of the industrial departments, and are mainly responsible for substantial increases in a number of stocks and shares. This evidence of confidence is again reflected principally in the shares of companies concerned with such branches of trade as may be supposed to benefit by the imposition of a tariff. The strength of Cables and Wireless stocks is the outstanding feature of the market with which we deal here, but the share list of electrical equipment shares exhibits useful advances in a number of cases. The tendency is, in fact, better all round.

Dramatic Gains in Cables and Wireless

The traffics of the Cables and Wireless combine are reported to be steadily increasing, and, helped by confidence in the result of the General Election and the supposition that the success of the National Party and all that it means will be responsible for a much greater expansion in the Combine's traffics, the prices of the three classes of stock show sharp rises on the week. The preference, in particular, followed a gain of 6½ points last week, with a rise of twice that amount to 63 this week. Advances of 4½ and 3 points, respectively, in the "A" and "B" stocks are due to the persistent hope that a distribution may in the near future be made in respect of the former. The two classes of shares of the Globe Telegraph and Trust, which, of course, has large holdings of Cables and Wireless stocks, enjoyed substantial rises in sympathy. The ordinary stand 35s. higher at 8¾, and the preference are 25s. up at 8¼. Marconi Marines have gone ahead to 35s. 9d. Anglo-Portuguese Telephones are better at 17s. American Telephone and Telegraphs at 175 and Internationals at 22½ are both unchanged.

Home Electricity Strength

Changes in this section, while few, are in the right direction. In the popular enthusiasm for industrial shares as a whole, the stocks and shares upon which fixed dividend rates are paid have been somewhat neglected. The fact that next year the dividends of the London electricity companies will be reduced to the level of 7 per cent., with a few exceptions, lays a check upon demand. With all fixed-interest stocks and shares the main factor is, of course, the devaluation of the £, with its consequent automatic reduction in the purchasing

power of money, and, following upon this, the necessary re-arrangement of prices. It is a little surprising, in fact, that the quotations for London electricity supply shares should have suffered so little loss as they have done. The decline has been materially less than that in the case of the bulk of fixed-interest stocks and shares. The suburban and provincial companies' shares are steady: Newcastle-upon-Tyne ordinary shares have recovered to 23s. 3d. Clyde Valleys have risen to 32s. Midland Counties ordinary at 27s. 6d. are 1/16 higher; Lancashires have improved at 25s. Northamptons are at 38s. and Richmond (Surrey) at £2. Atlas ordinary are better at 13s., and the preference at 21s. British Light and Power keep at 7s.

Railway Stocks Advancing

Metropolitan consolidated ordinary stock holds its last week's rise of 4 points at 59¼. Districts are up 2, to 59½, and Undergrounds at 19s. 6d. have gained 1s. The rest of the stocks in the Home Railway market are strong, with a distinctly better tendency amongst the fixed-interest issues. Prices in the latter now present a firmer front, in consequence of the substantial rises secured by British Government loans. There has been a good deal of money put into prior charge securities on behalf of American and foreign capitalists, apparently with the idea that, as the Socialists are likely to be ousted from power, British stocks and shares can be counted amongst the soundest to be obtained. Once more, it has become a matter of greater difficulty to buy stock than to sell it in this market.

Amongst the traction issues, London United Tramway 4 per cent. debenture has fallen 3 to 57½. At this price, the stock gives a yield on the money of nearly 7 per cent. London and Suburban Traction 5 per cent. preference continue weak at 8s. 3d. British Electric Traction deferred ordinary has not yet recovered from its fall to 600.

Latin Americans

Pennsylvania Water shares have fallen 5 to 87½, and the disposition has been for dollar shares to dwindle. In the Canadian group, Shawinigans are easier at 34½. Power Corporation of Canada remains at 42½, and Montreal Light and Power shares stand at the same price. Mexicans have not recovered from the acute weakness which overtook their prices in the middle of the month. Mexico Tramway ordinary shares have gone back to 9½. The 5 per cent. bonds are quoted at 25. Brazilian Tractions at 14¾ have put on 3 points. The preferred shares at 90 appear to have taken up something like a permanent position. Rio Tramways 5 per cent. mortgage bonds have fallen 5 to 67½. Brazilian securities as a whole, however, are in better favour, on the expectation that the Brazilian Government is about to formulate a scheme for reorganisation of the country's finances, which will involve, *inter alia*, suspension of interest on most of the loans for several years, and a consolidation loan that will include a number of the issues now outstanding.

Manufacturing and Equipment

The recent sharp rise in Telegraph Construction shares is explained by rumour as being due to negotiations, said to be in progress between this company and another that is desirous of obtaining control of the former undertaking. One or two names have been mentioned in connection with the matter, and possibly formal proposals will be laid before the shareholders of the Telegraph Construction and Maintenance Company at some time during the present week. According to this same industrious report, the holders are to be offered £12 per share, plus three shares in another concern, and the rise in the price of Telegraph Constructions to 14½ indicates that there is something more tangible than mere talk in the rumour. Callenders and British Insulated have risen to £3, Enfields to £4, Henleys are 5s. better at 6. It is as difficult now to obtain the offer of shares as a month ago it was hard to get reasonable bids for them. Associated Electrical Industries have risen 3s. 9d., this taking the shares to 25s. The company announces that the office of managing director has been discontinued, and that various changes are being made in order to reduce administration expenditure. General Electrics at 46s. 3d. show ¼ rise; the "B" preference at 25s. 6d. are also better. Brush ordinary has not budged from 55.

Colonial and Foreign

Adelaide Electric Supply Company has declared a dividend of 4½ per cent., tax free, making 8½ per cent. tax free, against 12 per cent. in the previous year. The prices of the 6 per cent. and "A" preference stocks stand at 70, the 6½ per cent. "C" preference stock at 73, and the 5 per cent. debenture stock at 80. The Calcutta Electric Supply Corporation announces an interim dividend of 5 per cent. less tax at 2s. 6d., being the same as that of a year ago, and the price has improved to 30s. 6d. ex dividend. The Consolidated Electric Light and Power Company of Baltimore has successfully negotiated a twenty-year contract with the Pennsylvania Railway covering the entire electrification requirements of a large part of the system. It is stated that the agreement will represent one of the largest sales of power ever covered in a single contract.

Amongst the home iron and steel shares, Babcock & Wilcox went up to 53s. 9d. in a general rise which lifted Vickers to 10s. and others in proportion. A large turnover is taking place every day. The market has captured public imagination to a rather remarkable extent. Some of the rises appear to have discounted favourable events for some time ahead. The rubber share market is as quiet as the iron and steel section is active.

Share List of Electrical Companies

HOME ELECTRICITY COMPANIES

	Nom.	Approx. Dividend. 1929.	1930.	Price, Oct. 20, 1931.	Rise or Fall.	Yield p.c. £ s. d.
Bournemouth and Poole	£ 1	15	15	58/9	—	5 2 2
Brompton Ordinary	1	8½	8½	27/6	—	5 1 0
Central Electricity 4½% Deb.	Stock	—	4½	89½	—	5 0 6
Charing Cross Ordinary	1	8½	8½	29/0	—	4 16 7
Chelsea	1	8¾	8¾	25/–	—	5 7 8
City of London	1	10	10	35/–	—	5 14 3
Clyde Valley	1	8	8	32/–	+9d.	5 0 0
County of London	1	11	11	43/3	—	5 1 9
Edmundsons' 7% Pref.	1	7	7	24/6	—	5 14 3
Elec. Supply Corporation	1	11	11	42/6	—	5 3 6
Kensington Ordinary	1	8	8	29/–	—	4 16 7
Lancs. Light and Power	1	7	6½	25/–	+⅛	5 4 0
London & Home Counties 4½% Deb.	Stock	—	—	87½	—	5 2 10
London Electric	1	8½	9	32/6	—	5 10 9
Metropolitan	1	9	10	38/9	+⅛	5 3 3
Midland Counties	1	6½	7	27/6	+⅛	5 1 10
Mid. Elec. Power	1	15	8	26/3	—	6 2 0
Newcastle-on-Tyne Ordinary	1	6	6	23/3	+⅛	5 3 0
Do. 7% Pref.	1	7	7	25/–	—	5 12 0
Notting Hill 6% Pref.	10	6	6	10½	—	5 14 3
North Met. Elec. 6% Pref.	1	6	6	22/–	—	5 9 1
St. James' and Pall Mall	1	8	8	29/–	—	4 16 7
Scottish Power	1	8	8	27/6	+6d.	5 16 4
South London	1	8½	8½	26/6	—	5 5 8
Urban Ordinary	1	7	7	27/6	—	5 1 10
Westminster Ordinary	1	8½	8½	28/–	—	5 0 0
Whitehall Elec. Invst. 7½% Pref.	1	7½	7½	21/6	—	6 19 6
Yorkshire Elec.	1	8	8	31/3	—	5 2 5

HOME RAILS

Central London Ord. Assented	Stock	4	4	70½	—	5 13 6
Metropolitan	,,	4	3½	39½	—	8 17 3
Do. District	,,	5	5	50½	+2	8 8 0
Underground Electric	1	8	8	19/6	+1/–	8 4 4

TELEGRAPHS AND TELEPHONES

Anglo-Am. Tel. Pref.	Stock	6	6	94	—	6 7 4
Do. Def.	,,	1½	1½	23	—	6 10 5
Cables & Wireless 5½% Pref.	Stock	5½	5½	63	+13	—
Do. A 7½% Ord.	,,	Nil	—	23	+4½	—
Do. B Ord.	,,	Nil	—	15½	+3	—
Globe Tel. and T. Ord.	10	10	8½	8¾	+1¾	—
Do. do. Pref.	10	6	6	8½	+1½	7 1 2
Great Northern Tel.	10	20	20	21½	—	9 6 0
Marconi-Marine	1	15	15	35/9	+9d.	8 7 10
Oriental Telephone Ord.	1	12	12	2¼	—	*5 12 11

HOME AND FOREIGN TRAMS, ETC.

Anglo-Arg. Trams First Pref.	5	5½	—	7/6	—	—
Do. do. 2nd Pref.	5	6	—	6/3	—	—
Do. do. 5% Deb.	Stock	5	5	11½	—	—
British Electric Traction Def. Ord.	,,	5	5	600	—	—
Do. do. Pref. Ord.	,,	8	8	105	—	7 12 5
Brazil Traction	100	8	—	14¾	+3	—
Brit. Columbia Elec. Rly. Pce.	Stock	5	5	90½	—	5 10 6
London & Sub. Trac. 5% Pref.	1	Nil	Nil	8/3	—	—
London United Tram Deb.	Stock	4	4	60½	—	6 12 3
Mexico Trams, 5% Bonds	—	5	5	25	—	20 0 0
Mexican Light Common	100	Nil	Nil	20	—	—
Do. 7% Pref.	100	7	7	35	—	20 0 0
Do. 1st Bonds	—	5	5	45	—	11 2 2
Victoria Falls Ord.	1	15	15	58/9	—	5 2 2
Yorkshire (West Riding)	1	Nil	Nil	6/3	—	—

MANUFACTURING COMPANIES

Assoc. Elec. Ord.	1	6	6	25/–	+3/9	4 16 0
Do. Pref.	1	8	8	26/3	—	6 2 0
Babcock & Wilcox	1	15	14	53/9	+½	*5 4 3
British Aluminium Ord.	1	10	10	30/–	+⅛	6 13 4
British Insulated Ord.	1	15	15	3	+½	5 0 0
Brush Ord.	Stock	10	5	55	—	9 1 10
Callender's	1	15	15	3	+⅛	5 0 0
Do. 6½% Pref.	1	6½	6½	22/6	+⅛	5 15 7
Crompton Parkinson Ord.	5/–	30	30	22/6	—	6 13 4
Do. 8% Pref.	1	8	8	28/3	—	5 13 3
Edison-Swan 1st Pref.	1	7½	7½	23/3	—	6 9 0
Do. 5% Deb.	Stock	5	5	92½	—	5 8 1
Electric Construction	1	5	Nil	10/–	—	—
Enfield Cable Ord.	1	25	25	4	+⅛	6 5 0
English Electric	1	Nil	Nil	7/6	—	—
Do. do. Pref.	1	Nil	Nil	7 6	—	—
Ferranti Pref.	1	7	7	19/9	–3d.	7 1 9
G.E.C. Pref.	1	6½	6½	23/–	—	5 13 1
Do. Ord.	1	14	10	46/3	+½	4 6 6
Henley's	1	30	30	6	+½	5 0 0
Do. 4½% Pref.	5	4½	4½	4½	—	5 6 0
India-Rubber	1	Nil	Nil	5/–	+6d.	—
Johnson & Phillips	1	10	10	27/6	—	7 5 6
Siemens Ord.	1	7½	7½	22/6	–⅛	6 13 4
Telegraph Construction	12	10	7½	14½	—	6 4 0

* Dividends paid free of Income Tax.

Our Foreign Electrical Trade

Imports and Exports during September

THE Government's decision to abandon the gold standard came too late in September to have much effect on the exports and imports of the United Kingdom for that month, and not until the figures for October are available will the results of this step commence to be apparent.

The Board of Trade returns for September do, however, record an increase of £709,142 in exports, as compared with August, although this increase is more than offset by a rise of over £3,000,000 in imports. Compared with the corresponding month of last year exports fell 30 per cent. and imports 18 per cent., increasing the adverse balance.

With regard to the electrical trade, it will be seen from our usual monthly table that while exports, at £868,822, were approximately 50 per cent. lower than in September, 1930, there was a slight increase (3 per cent.) in imports.

Compared with the figure for August, electrical exports show an increase of £87,037, due very largely to a rise of £81,006 in machinery exports. Unenumerated electrical goods and apparatus were also more in demand at £134,858, and advance of £22,682, while an increase of £14,549 was recorded in battery and accumulator imports. Carbons, a comparatively unimportant item, were another bright feature of the market. The most outstanding decreases occurred in insulated wires and cables (including non-submarine telegraph and telephone), which fell from £140,071 to £116,622, and telegraph and telephone apparatus, which declined by £8,428 to £118,111.

As compared with September, 1930, substantial declines are evident in almost all sections, the only items showing increases being batteries and accumulators, carbons, and "other motors and generators." Submarine telegraph and telephone cable, which, it is well known, is subject to violent fluctuations, fell by £503,834, while telegraph and telephone apparatus was £103,825 lower. Other poor features were insulated cables and wires (including non-submarine telegraph and telephone), which declined by £154,113, unenumerated electrical goods and apparatus (£78,868 decrease), unenumerated electrical machinery (£71,595 decrease), and glow lamps (£20,148 decrease).

The inset table gives an analysis by markets of the electrical machinery exports during September, 1931, comparing the figures with those of September, 1930. In spite of a decrease in the total volume of the goods exported, it is gratifying to note that for the first time for many months there was a slight increase in the quantity of the machinery exported. It will be seen that the European market and "other countries" were entirely responsible for this increase, as comparatively large falls are recorded in all other cases. Japan, it appears, has become an almost negligible buyer, while South America, Australia, New Zealand, and Canada between them accounted for a fall of £144,860 in the value of exported machinery.

Turning to the imports for the past month, it will be noticed that apart from small decreases in four sections there was an all-round increase in our purchases, as compared with the preceding month, the total value rising by £172,537 to £705,608. The greatest rise occurred in telegraph and telephone apparatus, other increases of note being in batteries and accumulators, electrical machinery and unenumerated goods and apparatus.

In comparison with September last year imports rose by £23,070, telegraph and telephone instruments being responsible for an increase of £44,448. Substantial rises were also shown in unenumerated goods and apparatus (£15,368), and carbons (£21,766), but meters and instruments at £30,732 were £43,886 lower.

During the first nine months of the year electrical exports fell in value by £4,966,038, as compared with January-September, 1930, the only item which shows an advance being electric carbons. Insulated cables and wires accounted for £1,246,300 of the decrease, while electrical machinery and unenumerated electrical goods and apparatus showed decreases of £633,008 and £623,900 respectively.

Imports for the period January-September were £1,440,930 lower than in the corresponding nine months of last year, the fall being due almost entirely to a decline of £1,021,308 in the meter and instrument section.

Electrical goods re-exported in September amounted in value to £21,386, and, although £3,123 higher than in the previous month, show a decline of 46 per cent. on the figure for September, 1930.

Electrical Machinery Exports

Destination.	Quantities. Sept., 1930. Tons.	Sept., 1931. Tons.	Increase or Decrease. Tons.	Values. Sept., 1930. £	Sept., 1931. £	Increase or Decrease. £
Europe	223	970	+747	53,916	137,888	+83,972
Japan	66	1	— 65	9,383	689	— 8,694
South America	292	85	—207	50,088	19,406	—30,682
South Africa	255	175	— 80	32,745	32,118	— 627
British India	312	267	— 45	57,713	48,671	— 9,042
Australia	471	80	—391	61,415	11,027	—50,388
New Zealand	174	72	—102	37,945	10,271	—27,674
Canada	358	60	—298	44,306	8,190	—36,116
Other Countries ..	265	878	+613	51,017	118,828	+67,811
Totals	2,416	2,588	+172	£398,528	£387,088	—£11,440

	Exports. Electrical exports for Sept., 1931.	Inc. or dec. as compared with August, 1931.	Inc. or dec. as compared with Sept., 1930.	Imports. Electrical imports for Sept., 1931.	Inc. or dec. as compared with August, 1931.	Inc. or dec. as compared with Sept., 1930.	Re-Exports. Electrical re-exports for Sept., 1931.	Inc. or dec. as compared with August, 1931.	Inc. or dec. as compared with Sept., 1930.
Electrical goods and apparatus (unenumerated)	£134,858	+£22,682	— 78,868	£159,443	+£28,506	+£15,368	£4,323	— £990	—£8,152
Insulated cables and wires ..	98,677	— 13,620	— 92,920	58,178	— 2,838	— 7,276	254	— 39	— 107
Glow lamps	24,448	+ 5,078	— 20,148	46,131	+ 12,964	— 4,819	825	+ 609	+ 174
Arc lamps and parts	251	— 443	— 585	2,578	— 2,040	+ 955	251	+ 239	+ 238
Batteries and accumulators ..	62,549	+ 14,549	+ 389	96,679	+ 36,081	— 9,791	838	+ 435	— 1,727
Meters and instruments ..	20,227	— 1,750	— 5,481	30,732	— 5,882	— 43,886	430	— 433	— 5,798
Carbons	2,478	+ 2,112	+ 1,465	33,046	+ 18,823	+ 21,766	51	— 54	— 781
Switchboards (not telegraph or telephone)	1,201	— 101	— 2,683	155	+ 127	+ 155	20	— 10	—
Electrical Machinery—									
Electrical machinery (unenumerated)	215,317	+ 52,684	— 71,595	117,247	+ 31,833	+ 6,100	10,078	+ 4,455	+ 51
Railway and tramway motors	1,000	— 1,083	— 5,319	—	—	—	—	—	—
Other motors and generators	170,771	+ 29,405	+ 65,474	—	—	—	—	—	—
Telegraph and Telephone Cable and Material—									
Telegraph and telephone wires and cables (not submarine)	17,945	— 9,829	— 61,193	1,504	— 79	+ 50	—	— 2	— 207
Submarine telegraph and telephone cable	989	— 4,219	—503,824	—	—	—	—	—	—
Telegraph and telephone apparatus	118,111	— 8,428	—103,825	159,915	+ 55,042	+ 44,448	4,316	— 1,087	— 1,592
Total	£868,822	+£87,037	—£879,078	£705,608	+£172,537	+£23,070	£21,386	+£3,123	—£17,901
Decrease for the first nine months of the year ..	Exports £4,966,038			Imports £1,440,930			Re-Exports. £238,048		

Correspondence

Correspondents should forward their communications as early as possible. No letter can be published unless we have the writer's name and address in our possession

Still the Boiling Plate

From the paragraph on p. 562 of your issue of 16th inst. it might appear as though you were not conversant with the latest developments, as you state that "the average boiling plate is still a weak link" and that "efforts should not be relaxed towards finding a quick boiling plate which can be installed as an integral part of all cookers."

I quite agree that the *average* boiling plate is a weak link, but the "Superspeed" boiling plate fitted as an integral part of a well-known make of cooker is quite comparable with a gas ring in every respect *and gives off no fumes.*

It has been on the market since early in 1929, but the majority of British buyers are so slow at even giving a new idea a trial (which no doubt the manufacturers would be pleased to arrange free of cost to the buyer) that it will probably be *years* before they wake up to the fact that a boiling plate to compete with gas *does* exist.

As the rapid development of the cooking load entirely depends on the use of a boiling plate that *does* compete with gas, I suggest that it is high time that a competitive trial was instituted by some independent authority on the lines of the Royal Agricultural Society's trials of farming appliances.

ARCH. J. HOWARD,
Borough Electrical Engineer.

Taunton, *October 17th*, 1931.

Power-plug Points

Many new houses are being built and all are being wired for electric light; the specifications often provide for power points in certain of the rooms. Go to the new houses and look at the power points. You find them on the skirting board when they should be at waist level, *i.e.*, about 3 ft. from the floor.

When the power switch-plug is on the skirting board, it (1) is liable to damage from the broom, vacuum-cleaner, furniture, and feet; (2) provides a temptation to the children to play with it; (3) entails stooping or kneeling for its operator; (4) harbours dirt and is not easily dusted; (5) may be obscured by the coal-box (when this is retained as an ornament!); (6) possesses no advantages.

On the other hand, if the switch-plug is of the recessed type and is placed at waist level, *i.e.*, 3 ft. from the floor, it will be as cheap to install and as easy to operate, and it will possess no disadvantages. Have contractors considered these points? The comments of your readers would be welcome.

F. C. BEST.

New Barnet, *October 16th*, 1931.

The Faraday Exhibition

Though but a mere infant in matters electrical, yet one whose chief souvenir of early studies is a "Queen's Prize" in the shape of a copy of Ganot's Physics, *circa* 1879-80, permit me to supplement your remarks anent the "voluntary helpers" at the Faraday Exhibition in your issue of October 9th.

One of my great delights at the Albert Hall was to witness the unfailing patience of those in charge of the various exhibits with their questioners and with the scores and scores of questions with which the latter plied them, notwithstanding the, at times, very, very elementary nature of the queries.

Splendid also was the evident and keen desire to give of their very best to students and school-boys. More than once I heard "Let that little chap come to the front. He can't see," and then the "little chap" was pushed forward and given apparatus to handle and scrutinise, and a free tongue to catechise!

Who shall say that amongst those thousands of boys (and girls) there were no potential Faradays, no Clerk-Maxwells, no Edisons?

JAMES J. TYRREL.

London, N.W.11, *October 14th*, 1931.

The Electric Drive in Factories

I am particularly interested in the article appearing in your October 9th issue bearing the above title.

Although it would appear that Mr. W. P. Conly has had very extensive experience in the application of electric motor drives in factories, it is evident that he has not had such opportunities with heavy-oil engines.

The case for the electric drive for factories has been put forward in the very best possible light, since not one word has been mentioned about power factor and its rectification or the kW charge. Furthermore, on page 528, Mr. Conly mentions the figure of 0.5 lb. of fuel per b.h.p. per hour on full load. This information would have been correct approximately ten years ago, but we, as oil-engine manufacturers, state definitely that we should be unable to sell an engine of about the power mentioned that had a consumption of over 0.40 to 0.45 lb. per b.h.p.

At the head of the second column on the same page, Mr. Conly makes mention of second-hand values, but we hesitate to state what the values are of the multitude of electric motors in the second-hand market to-day.

The last paragraph indicates that Mr. Conly is entirely out out of touch with present-day oil-engine practice, as I see he makes mention of hot-bulb engines.

It would be comparatively easy to show not only that an oil-engine belt-driving the factory is cheaper to run than an electric motor taking its supply from a power supply company, but that an oil engine directly coupled to a generator and supplying electricity to various motors in the factory can also be operated more cheaply.

For Petters, Ltd.,
R. H. GREEN,
Manager, Engine Sales.

Yeovil, *October 16th*, 1931.

Protection from Lightning

I am confident that a number of electrical installation contractors like myself would like to hear the views of competent authorities as to whether or no short overhead lines—say 50 to 500 yards in length—installed between buildings, for lighting or power, should be provided with apparatus protecting them against the liability of damage from lightning, and if so to receive some suggestion as to the best and most economical means to this end. Is there any standard and inexpensive apparatus made for the purpose?

I appreciate that risk from lightning damage depends to a great extent upon the situation in which such lines are erected, but there seems to be considerable divergence of opinion between engineers on this subject, and I should appreciate some enlightenment on the matter.

J. H. ROBINSON.

Croydon, *October 19th*, 1931.

"Power Control"

Dr. Garrard's article, which appeared in your last issue, briefly discusses the internal pressures likely to be generated in oil circuit breakers and states that the necessary strength varies with the rated rupturing capacity, but this statement as well as the curves shown are liable to be misleading to your readers. His remarks also on the relative merits of round tanks and rectangular tanks call for some observations.

It is by no means true that the internal pressure must increase with the breaking capacity as shown on the curve of hydraulic test pressures. This curve is misleading because the pressure developed in the tank is a function of the design of breaker and varies widely over the range of breakers offered in this country, when rupturing the same amount of short-circuit power, *e.g.*, a rectangular tank breaker and a round tank breaker with different physical dimensions made by this company, for the same kVA rating, can develop gas pressures in the ratio of 2/1. This has definitely been proved by test.

Furthermore, pressures double those shown in the curve have actually been recorded at certain rupturing capacities, whilst at other short-circuit powers pressures of less than half those shown in the curve are the maximum obtainable. It is in fact possible to design a line of breakers covered by the range in the curves on which the maximum pressure developed would be constant for all sizes. It is thus obviously meaningless to relate breaking capacity to tank pressure without reference to the design and physical dimensions of the breakers.

Some tens of thousands of rupturing capacity tests have enabled those who have conducted them to determine with reasonable accuracy the highest pressures that may occur when rupturing a given kVA in a breaker of given physical dimensions, but, obviously, such information, obtained at very great expense, cannot be broadcast.

As regards round tank versus rectangular tank breakers, the author gives one of the main reasons for the adoption of the former in his statement that "the first criterion of merit of a circuit breaker tank is its capability to withstand internal pressure." Although, in theory, a rectangular tank can be made as strong as a round tank, the former will require much more metal and bracing than the latter, and hence will be much heavier. The stresses in a round tank and domed top plate are more accurately determined than those in a rectangular tank with an approximately flat top plate. This is due to the large part played by secondary stresses in the rectangular tank construction. Hydraulic testing experience on both types of construction has clearly shown the rectangular tank to be less consistent in its performance than the round tank. Furthermore, the strength of the joint between tank and top plate, is very important. The most efficient construction is a circular machined tongued and grooved gasketed joint. With rectangular tanks it is very difficult to make a joint that can be depended upon to prevent oil throw.

The author's diagram gives a comparison between internal dimensions only. If actual examples of the two types of breaker are considered it will be found that any advantage the rectangular tank has, based on internal dimensions, will be nullified by the massive bracings and tank fixings which are required to give equality of strength with the round tank construction. It is not without significance that the leading American and German manufacturers, who have had long experience with short-circuit testing plant, have found considerable application for the round-tank breaker.

FERGUSON, PAILIN, LTD.

Manchester, *October 19th*, 1931.

Book Reviews

Staubausscheidung An Einfachen Körpern und in Luftfiltern. (Precipitation of Dust on Plain Bodies and in Air Filters.) By DR. W. SELL. Berlin VDI-Verlag, 24 pp., with 65 illustrations. Price, 5 Rm.

One result of the vast growth of industrialisation and traffic in all civilised countries has been a steady increase in the generation of dust—a serious danger to human beings and plants and a cause of wear in machinery In this book, following a brief review of the principal kinds of dust and their occurrence and generation, the various methods available for combating dust are broadly considered. In the succeeding detailed inquiry into the problem of the expulsion of dust from flowing gases by the mass effect obtaining with the curved flow, equations of motion are evolved on the basis of Stokes's law of resistance. The deposition of dust on a cylinder, a disc, and in a pocket are calculated with the aid of a non-dimensional index containing all independent variables, the calculated findings being corroborated by the results of experiments. The investigations relating to dust deposition in air filters include oil-wetted metal filters, for which a favourable corrugated sheet section is determined. Also in this case, the deposition of dust may be expressed by a formula based on a filter coefficient, flow tests having demonstrated the existence of a similarity to the flow conditions existing in a tube. With the object of generalising the results, a uniformly applicable formula is developed by the author, from which the degree of dust extraction obtained with any filter may be computed.

Steam Turbine Operation.. By WILLIAM J. KEARTON. Pp. xi+300; figs. 172. London: Sir Isaac Pitman & Sons, Ltd. Price, 12s. 6d. net.

Many of our readers will be familiar with Mr. Kearton's excellent book, entitled "Steam Turbine Theory and Practice," a text-book, written primarily to meet the requirements of students in technical colleges, and the draughtsmen and designers in the turbine manufacturing works. The book under review may be regarded in many ways as a companion to the earlier volume, but it is written for the men who are concerned with the actual running of the steam turbine in the power station.

The contents may conveniently be divided into three distinct parts, viz., the installation of the machine, running, and finally, maintenance and overhaul.

Another section is one dealing with turbine testing. It is not sufficient for the usual consumption and efficiency tests to be made when the machine is first erected, routine tests could be made, say, once every year. In this way any defects which may tend to develop will be checked in their early stages.

In one or two places the book bears the imprint of the lecturer rather than the operating engineer, but it is certainly a thoroughly practical treatise, and one which can be recommended with the utmost confidence to every power station engineer. The student also who is desirous of studying his subject from the strictly practical point of view can also be urged to read this book.

Recording Sound for Motion Pictures.—Edited by Lester Cowan for the Academy of Motion Picture Arts and Sciences. Pp. xv+404; illustrated. London: McGraw Hill Publishing Co., Ltd. Price 25s. net.

This is a book which requires explanation. It is not the work of a single author, but was edited by Mr. Lester Cowan for the Academy of Motion Picture Arts and Sciences. This society, probably the most active of its kind, has had the benefit of lectures from most of the leading members in the profession, which have later been published as proceedings, and it is these proceedings which Mr. Lester Cowan has selected and now edited in book form. On the one hand the advantage of such a system is that, each author being a specialist in his own branch, the collected work has a greater information capacity than could be collected singly by any one author; on the other hand, however skilfully the selection and editing may have been done there is bound to be both overlapping and contradiction, which makes it difficult for the general reader to reach the information for which he is seeking.

As all the contents of this book appear to have been previously published in the proceedings of the society, it may be found advantageous to obtain whichever of them is required singly.

Mathematics for the Practical Man. By GEORGE HOWE, M.E. Pp. v+143; figs. 42. London: Crosby Lockwood & Son. Price 5s. net.

A title such as this prompts the thought—What does the "practical" man want with mathematics anyway? Cannot he use his fingers to count on? The curious notion that it is somehow more "practical" to short-circuit all theory and leave out everything not immediately and obviously applicable to the job in hand is evidently not confined to this side of the Atlantic. In reviewing such a book all that is really necessary is to quote the sub-title, "Explaining Simply and Quickly all the Elements of Algebra, Geometry, Trigonometry, Logarithms, Co-ordinate Geometry, Calculus." The capitals are the author's, and when it is added that this magnificent programme is supposed to be covered in a length equivalent to three or four chapters of an average-sized text book, without assuming any knowledge beyond arithmetic it will be seen that the author is not lacking in courage.

The elements of algebra are first dealt with, including what is called "factoring," and this is followed by "some" elements of geometry (but not very many). Trigonometry and logarithms have a few pages each, and the author's general attitude may be gauged from his condescending introduction to the latter chapter: "I have inserted this chapter on logarithms, because I consider a knowledge of them very essential to the education of any engineer." The last chapter deals with the calculus, both differential and integral. Even of this small space, nearly one-half is taken up by a consideration of the rate of development of a variable with respect to itself, whatever that may mean. In fact, the author throughout is attempting the impossible, without even realising that it is difficult. The preface is dated, "New York, September, 1910," and there is no reason given to account for the twenty-year interval.

Legal

Alleged Breach of Employment Contract

MR. JUSTICE ROWLATT, in the King's Bench Division on October 15th, heard an action brought by Walter L. W. Schallrenter, against Atomlite (Parent Co.), Ltd., of Wembley, for damages for alleged breach of contract of employment. Plaintiff is a chemical engineer, and defendants are manufacturers of neon electric advertising signs. The defendants agreed to engage plaintiff as technical adviser and manager of their factory. The salary was paid monthly for a yearly engagement and amounted to £600 per annum with certain bonus and a prospect of a further increase. In April, 1930, the business was purchased by the Claude General Neon Lights, Ltd., and plaintiff alleged that it was understood that he was transferred to the new company on the same terms and conditions.

The defence was that the plaintiff terminated his employment on his own account. When the defendants consolidated their business with the General Electric Co., Ltd., it was agreed that they should engage the old firm's employés at the same rates.

Judgment was given for the defendants, his Lordship holding that the position did not carry with it any warranty.

A Crane Driver's Death

MESSRS. DORMAN, LONG & CO., LTD., Middlesbrough, were fined £10 at the Middlesbrough Court on October 14th as the sequel to the death of a crane driver named Cooper. The facts as explained by the Inspector of Factories were that some electric cranes were engaged in transporting steel, and Cooper was found dead near his crane cab. It appeared that an alteration had been made to some electric wires whereby the interlocking system had been done away with, and two ends of the wires on which there were connections had been pinned together by a bolt. That joint had been left bare, in a position near the supply wires. It was assumed that if the main contact switch in the cab was closed this joint would be alive. The driver had evidently taken hold of the bolt not knowing that it was alive. The complaints against the company were that the connection had not been properly insulated and that it had not provided access to the cab free from danger to the driver.

For the company it was stated that this was only the second accident in forty years and that the fault in the crane had now been remedied. If the man had switched off the current according to orders the fatality would not have occurred.

A Compensation Claim

In the Shoreditch County Court on October 19th, before Judge Dumas, Mrs. Emma Herbert, Edmonton, N., with her three children, claimed £600 under the Workmen's Compensation Act from the Shoreditch Borough Council in respect of the death of her husband, Alfred Herbert, who had been employed in the Council's Electricity Department.

Mr. Scott Duckers, solicitor for the applicants, said the deceased was employed as a cable jointer. On June 27th, 1930, whilst he was working in Shaftesbury Street, a short-circuit occurred, and he received severe burns on his face, head, hands and wrists. He was paid 30s. a week compensation to the date of his death, more than twelve months later. Death was stated to be due to an abscess of the liver.

After medical evidence had been given for the applicants, Dr. R. L. Galloway, who conducted the post-mortem examination, said that in his opinion the accident had nothing to do with Herbert's death.

Judge Dumas said the case was of an extremely difficult and distressing nature. He could not find that death was due to the accident, and he would have to enter judgment for the respondents, with costs.

Published Specifications

Compiled expressly for this journal by a firm of chartered patent agents. The numbers in parentheses are those under which the specification will be printed and abridged, and all subsequent proceedings will be taken.

1930

8,724/7. "Electric storage cells and batteries." S. A. Pollock. March 18th, 1930. (357,504/7.)

11,787. "Electrical insulators." Dr. S. Just. September 16th, 1929. (357,510.)

12,072. "Electric transformers and the like." British Thomson-Houston Co., Ltd. April 22nd, 1929. (357,511.)

12,416. "Method of and weld-rod for electric arc-welding." A. F. Burgess (A. O. Smith Corp.). April 22nd, 1930. (357,512.)

13,486. "Electric transformers." International General Electric Co., Inc. May 1st, 1929. (357,651.)

15,293. "Electrodes for positive column luminous gaseous conduction tubes, and process of making same." W. W. Triggs (Q.R.S.—De Vry Corp.). May 19th, 1930. (357,516.)

15,489. "Electric batteries." Burgess Battery Co. July 30th, 1929. (357,561.)

16,186. "Call-finding arrangements in automatic and semi-automatic telephone systems." Siemens Bros. & Co., Ltd., and R. G. Dixon. May 26th, 1930. (357,607.)

16,437. "Apparatus for electric arc-welding." G. Benedetto. May 28th, 1930. (357,615.)

16,489. "Changing display apparatus for use with totalisators, score indicators, and the like." Siemens Bros. & Co., Ltd., and J. H. Broome. May 28th, 1930. (357,616.)

16,525. "Wire joints and wires for electricity transmission." British Dardelet Threadlock (D.D.G.) Corp., Ltd. June 1st, 1929. (357,617.)

18,027. "Electric circuits employing thermionic valves or the like." Standard Telephones & Cables, Ltd., and C. R. Dunham. June 12th, 1930. (357,532.)

18,202. "Circuit arrangement for telegraph installations with selector working." Siemens & Halske Akt.-Ges. July 16th, 1929. (357,521.)

18,212. "High-potential transformers." Koch & Sterzel Akt.-Ges. October 15th, 1929. (Addition to 11,208/30.) (357,522.)

18,517. "Control systems for dynamo-electric machines." T. B. Somerville and Associated Electrical Industries, Ltd. June 17th, 1930. (357,524.)

18,553. "Electric synchronising apparatus." J. H. O. Harries. June 18th, 1930. (357,535.)

18,663. "Call-metering circuits in telephone systems." Telefonaktiebolaget L. M. Ericsson. June 21st, 1929. (357,620.)

18,705. "Magnetic structures and methods of making same." Standard Telephones & Cables, Ltd. August 24th, 1929. (357,537.)

18,868. "Dielectric materials." Standard Telephones and Cables, Ltd., M. C. Field, W. E. Hugh, and L. G. B. Parsons. June 20th, 1930. (357,624.)

18,990. "Call metering in automatic and semi-automatic telephone systems." Telefonaktiebolaget L. M. Ericsson. June 28th, 1929. (357,568.)

19,260. "Amplifying systems." British Thomson-Houston Co., Ltd. June 24th, 1929. (357,572.)

19,359. "Electric glow-discharge devices." Electrical Research Products, Inc. June 26th, 1929. (357,590.)

19,463. "Process of purifying solutions by electrolytic means." I. G. Farbenindustrie Akt.-Ges. June 28th, 1929. (357,630.)

19,470. "Radio signalling systems." Standard Telephones and cables, Ltd. (Western Electric Co., Inc.). June 26th, 1930. (357,631.)

19,471. "Low-temperature emissive cathodes for electric discharge devices." Standard Telephones & Cables, Ltd., and W. E. Benham. June 26th, 1930. (357,632.)

19,489. "Telephone systems." Automatic Telephone Manufacturing Co., Ltd., and G. F. Sargeson. June 26th, 1930. (357,633.)

19,492. "Electrical key switching devices." J. E. Pollak (Associated Telephone & Telegraph Co.). June 26th, 1930. (357,634.)

19,580. "Radio direction finding systems." Electrical Research Products, Inc. June 29th, 1929. (357,640.)

19,727. "Wave signalling systems." J. Robinson. June 28th, 1930. (357,647.)

19,965. "Fluid-break electric circuit-interrupters." British Thomson-Houston Co., Ltd. July 1st, 1929. (357,654.)

20,008. "Continuously-loaded long-distance electric cables." Siemens & Halske Akt.-Ges. July 5th, 1929. (357,657.)

20,515. "Combination radio-receiver and phonograph." Kolster-Brandes, Ltd. July 17th, 1929. (357,662.)

20,574. "Tap-changing devices for electric transformers." Allen West & Co., Ltd., and F. Bergmann. July 7th, 1930. (357,663.)

21,256. "Smoothing systems for use in connection with the supply of electric current or potential to photo-electric cells, thermionic valves, and the like." Edibell Sound Film Apparatus, Ltd., and W. M. Betts. July 14th, 1930. (357,676.)

21,783. "Electrical insulators." Hermsdorf - Schomburg Isolatoren Ges. August 12th, 1929. (Addition to 289,709, 297,613, and 23,703/29.) (357,683.)

21,796. "Radio apparatus." A. W. Ruyssenaers. July 18th, 1929. (Addition to 10,208/30.) (357,684.)

22,013. "Television and like systems." Marconi's Wireless Telegraph Co., Ltd. July 19th, 1929. (357,687.)

22,296. "Electric fuses." C. W. Cox. July 24th, 1930 (Cognate application 24/31.) 357,691.)

22,377. "Electric arc projectors." C. H. Champion and Co., Ltd., and C. H. Champion. July 24th, 1930. (Cognate application 38,868/30.) (357,695.)

23,056. "Reduction gear pulley for electric motors." W. M. Herd. July 31st, 1930. (357,706.)

25,696. "Electric switches with quenching liquids." Voigt & Haeffner Akt-Ges. Aug. 29th, 1929. (357,739.)

25,711. "Manufacture of rubber articles by electro-deposition." Anode Rubber Co., Ltd. Sept. 26th, 1929. (357,740.)

28,064. "Electrolytic cells." M. E. Macgregor and Young Accumulator Co. (1929), Ltd. Sept. 19th, 1930. (357,765.)

28,294. "Scale-lighting device for radio receiving apparatus." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. Oct. 3rd, 1929. (357,770.)

28,469. "Electron discharge tubes." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. March 4th, 1930. (357,774.)

28,857. "Electric switches or circuit breakers." S. Ruppel. Dec. 31st, 1929. (357,785.)

29,078. "Electric switches with delayed action." Benton & Stone, Ltd., and H. G. Atkinson. Sept. 29th, 1930. (357,787.)

29,223. "Boxes or cases such as used for containing electric fuses, switches and the like." Simplex Conduits, Ltd., and H. F. McLoughlin. Sept. 30th, 1930. (357,792.)

29,304. "Gas-filled electric discharge tubes." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. Feb. 25th, 1930. (Addition to 7,792/30.) (357,794.)

29,925. "Electric commutating devices." British Thomson-Houston Co., Ltd. Oct. 5th, 1929. (357,797.)

31,651. "Automatic control systems for railways." M. P. Gaspar. Oct. 21st, 1930. (357,815.)

32,815. "Variable electric condensers." A. Onwood. Oct. 31st, 1930. (357,828.)

33,105. "Electric fuse boards or distribution boards." J. H. Tucker & Co., Ltd., and J. E. Gaffney. Nov. 4th, 1930. (357,830.)

34,834. "Electric welding-machines." D. Sciaky. Nov. 22nd, 1929. (357,852.)

35,514. "Radio or other high-frequency coupling arrangements." Marconi's Wireless Telegraph Co., Ltd. Dec. 3rd, 1929. (357,866.)

35,687. "Adjustable brackets or supports for telephones." A. G. Westmoreland. Dec. 5th, 1930. (Addition to 313,107.) (357,867.)

37,836. "Devices for damping oscillations of overhead electric conductors." Vereinigte Aluminium-Werke Akt-Ges. Dec. 16th, 1929. (Addition to 30,912/30.) (357,877.)

37,837. "Devices for damping oscillations of overhead electric conductors." Vereinigte Aluminum-Werke Akt-Ges. Dec. 17th, 1929. (Addition to 30,912/30.) (357,878.)

38,108. "Indicating arrangements for counters." M. B. Richter (trading as Telefon Fabrik Automatic.) Nov. 4th, 1930. (357,881.)

38,560. "Electric cells or batteries." Soc. Anon. le Carbone. Nov. 20th, 1930. (357,886.)

39,068. "Electric batteries having an electrolyte of a solution of ammonium chloride." Soc. Anon. le Carbone. Nov. 19th, 1930. (357,890.)

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1,001. "Searchlights," L. D. Reymond. Jan. 18th, 1930. (357,907.)

1,568. "Electric accumulator cells." Britannia Batteries, Ltd. Jan. 16th, 1930. (357,910.)

2,093. "Radio and other high-frequency receivers." Telefunken Ges für Drahtlose Telegraphie. Feb. 25th, 1930. (357,913.)

7,657. "Electric insulator especially for stretching antennae." A. Kathrein. Oct. 2nd, 1930. (357,932.)

13,277. "Television receivers." British Thomson-Houston Co., Ltd. May 17th, 1930. (357,941.)

14,423. "Movable systems for an electro-dynamic device for converting electrical oscillations into acoustic vibrations or conversely." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. May 26th, 1930. (357,942.)

Trade Mark Applications

THE following are among the recent applications for British trade marks. Objections may be entered against any of the proposed marks within one month from October 14th:

Wufa. No. 517,022. All goods in Class 8.—Moses Lichtenberg, 4, Great Queen Street, W.C.2.

Visipulse. No. 525,443. Class 8. Electrical apparatus for use by choirmasters in directing choirs.—Harold Whitehall, trading as Aurola House, 11, Churchgate, Loughborough.

Creda. No. 516,114. Class 13. Immersion heaters, electric kettles, irons, urns, vegetable boilers and steamers, etc.—The Credenda Conduits Co., Ltd., Credenda Works, Rood End Road, Oldbury, Birmingham.

Shell Brand (lettering and design). No. 523,759. Class 50. Transformer oils for electrical insulating purposes, etc.—The Shell Co. of East Africa, Ltd., St. Helens Court, Great St. Helens, E.C.3.

Ondoïne. No. 524,782. Class 50. Mouldable material consisting principally of synthetic resin sold in solid or powder form. —La Société Française du Ferodo, 2, Rue de Chateaudun, Paris, 9, France. (British representative: S. Sokal, 1, Great James Street, Bedford Row, W.C.1.)

Electrical Progress in Madras

According to the report of the Electrical Inspector to the Government of Madras for the year 1930-31, the total number of towns with an electricity supply now amounts to twenty-one, of which four were electrified during the year. The total generating capacity of all undertakings amounts now to nearly 33,000 kW. There was no noticeable improvement in general in the cost of production, and the average price per kWh paid by the consumer did not alter. A model form of street lighting agreement between licensed undertakings and local authorities was drawn up and is now generally used. The report refers to the electrification of the suburban service of the South Indian Railway. This development is interesting, as it is the first metre gauge electrification in India, 1,500 V d.c. being adopted.

New Work for Contractors

Particulars of new works and building schemes for the use of electrical installation contractors and traders

Publication in this list is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Banffshire.—Rebuilding of Aberlour Orphanage (£10,000); the superintendent.

Batley (YORKS.).—Houses (22), Mount Pleasant, for the T.C.; H. L. Hall, borough engineer.

Birmingham.—Offices for the estates department, Summer Street (£4,000); city engineer. Telephone exchange, Weeford; H.M. Office of Works.

Blyth (NORTHUMBERLAND).—Houses (100), Bebside and Thornton; borough engineer.

Bolton.—Houses (265), bungalows, and shops, Cameron Street estate; borough engineer.

Bramley (YORKS.).—Houses (27) for the Rotherham R.D.C.; A. E. Lant, engineer and surveyor, Grove Road, Moorgate, Rotherham.

Bridlington (YORKS.).—Houses (50) for the T.C.; Jacques and Greaves, builders.

Brighton.—Reconstruction of fish market and cold storage plant (£2,700); borough engineer. Extensions to 48, London Road; George Mence Smith, Ltd. Alterations and additions, 145, North Street; Prudential Assurance Co., Ltd. Development of Sunnydale estate; H. A. Costerton.

Cardiff.—Offices, messrooms, stores, &c., at Canton, for the G.W.R.; F. R. E. Davis, secretary, Paddington Station, London, W.1.

Carlisle.—Garage for the Ribble Omnibus Company (£35,000). Conversion of premises in Terrace Road for mental institution; city engineer. Offices and showrooms, Lowther Street; H. Foxall, architect.

Clacton-on-Sea (ESSEX).—Bank, Station Road, for the Midland Bank, Ltd.

Doncaster.—Aerodrome and extensions to Highway Department's Depôt for the B.C.; also extensions to Grammar School for the E.C.; R. E. Ford, surveyor, Municipal Offices.

East Kilbride (GLASGOW).—Bank premises, Main Street, for the Union Bank of Scotland, Ltd., 191, Ingram Street, Glasgow.

Farnham.—Housing scheme; U.D.C. surveyor.

Garstang (LANCS.).—Re-erection of portion of Oakenclough Paper Mills, Calder Vale, for Harold Jackson (£16,000).

Gillingham (KENT).—Houses (48), Dial Road, for R. Pierson; W. G. Ingram, architect.

Glasgow.—Houses (230), Netherton estate; housing director.

Golcar (HUDDERSFIELD).—Cinema theatre; Stocks, Sykes and Hickson, architects, 4, St. Peter's Street, Huddersfield.

Goole.—Church; F. Turner, architect, Carlisle Street.

Great Yarmouth.—Alderman Leach School (£11,129), for the borough E.C.; director of education.

Hamilton.—British Linen Bank, Cadzow Street; Alex. Cullen, architect, 88, Cadzow Street.

Harpenden (HERTS.).—Houses (72), Grove Road, for the Workmen's Housing Association.

Hull.—Housing scheme, Tranby Croft; city architect.

Inverness.—Houses (24), Mallaig, for the C.C.; George Gordon and Co., architects, 6, Queensgate, Inverness.

Kingston-on-Thames.—Houses (40), Norbiton, for the T.C.; borough surveyor.

Leeds.—Premises, Regent Street, for the Central Garage, Ltd., 4, Town Hall Square, Bradford; W. A. Ross & Son, architects, 75, Manningham Lane, Clayton, Bradford.

Liverpool.—Extension to works, Hartley Avenue, Aintree, for W. P. Hartley, London and Aintree; Frederick W. Nicholson, architect, 2, Dewey Avenue, Aintree. School, Knotty Ash (£20,000); director of education, Education Offices, Sir Thomas Street.

London.—(BALHAM).—Additions to Weir Hospital, Grove Road; R. J. & J. S. Thomson, architects, 49, Hill Road, Wimbledon, S.W.10. (EALING).—Houses (27), Hill Rise and Birkbeck Terrace; T. Spencer Bright, architect. Shops (10) and garages, Ealing Road, Northolt; T. Davies, Harrow, architect. Flats (46), Western Avenue; T. P. Bennett & Son, architects. Houses (22), Claremont Road; P. Chase Gardener & Co., Hounslow. Office and works for Hoovers, Ltd., Western Avenue; Wallis Gilbert & Partners, architects. Alterations and additions, 44 and 45, The Broadway; Lloyds Bank, Ltd. Offices and workshops for J. & J. H. Boothman (1930), Ltd.; A. E. Bidwell, architect, Northolt. Flats (24), Cleveland Road; A. S. Hopkins, 70, Thorney Hedge Road, Gunnersbury Avenue, W.4. (HACKNEY).—Swimming bath, London Fields (£7,200); City Construction Co., Ltd., Bow, E. (ISLINGTON).—Extensions to Caledonian Road Baths (£9,290); borough engineer. (KENSINGTON).—Buildings, corner of High Street and Argyll Road; L. Mouchel & Partners, Ltd. Buildings at corner of Kensington Road and Holland Road for R. Sharp; Edmond Coignet, Ltd. (ST. PANCRAS).—Buildings, 71-3, Whitfield Street, for F. W. Southgate; Milner & Crase. (WANDSWORTH).—Shops, Garratt Lane; North Robin & Wilsdon, architects, Greycoat Place, S.W.1. (WESTMINSTER).—Rebuilding, Hotel Curzon, Curzon Street and Bolton Street; Henry Tanner. Rebuilding, Queen's Hotel, Leicester Square; H. K. Dyson. Additions, 86, Vincent Square; White, Allom & Co. (BERMONDSEY).—Municipal centre with baths, library hall and clinic, Silver Street area (£47,500); B.C. works manager. (CITY OF LONDON).—Reconstruction of 18-20, Cullum Street; Gervase Bailey. (FULHAM).—Buildings, North End Road and Haldane Road; A. E. Baxter. Offices, workshops, &c., Lillie Road Underground Railway; V. A. M. Robertson. (SOUTHWARK).—Shop, 64, Camberwell Road, for the United Dairies, Ltd.: F. T. Dear, architect. Tenements, Doddington Grove (£31,840); Higgs & Hill, Ltd., Lambeth. Building on site of 29-33, Empress Street; Riley & Glenfield, 6, Raymond Buildings, W.C.1. Additions, 159-163, Southwark Bridge Road; A. E. Russell, 13, Basinghall Street, E.C.2. Road through Borough Market; A. W. Cooksey and Partners, 6, Adam Street, W.C.2. (WALWORTH).—Reconstruction of premises, Vine Street; C. G. Fortune, 2, Poplar Road, Sutton.

Manchester.—Reconstruction of Café Royal, Peter Street and Bootle Street; manager. Stores, offices, showrooms, etc., Plymouth Grove, for Iliad & Company, Ltd., 164, Plymouth Grove, Chorlton-upon-Medlock; J. Paley Parrish, "Woodgarth," Broad Road, Sale.

Morden (SURREY).—Two churches, St. Helier estate; Church of England authorities.

Newcastle-on-Tyne.—Houses (98), St. Anthony's estate, for the C.C.; R. E. Roberts, housing architect, Town Hall. Extensions to the nurses' home, Walker, for the C.C. (£16,655); S. Fenwick & Co., builders, Dunn Street.

North Riding.—School at Dormanstown for the C.C. (£8,740); R. A. Blackett & Sons, builders, Darlington.

North Witchford (CAMBS.).—Houses (24) for the R.D.C.; T. W. Dack, builder, Doddington.

Orpington.—Houses (56), Swanley Junction, for the R.D.C.; surveyor.

Otley.—Catholic church and presbytery; Empsall, Clarkson and Clarke, architects, Piece Hall Yard, Bradford.

Ouseburn.—Sewage pumping station, Acomb; surveyor to the R.D.C.

Oxford.—Buildings, 68-73, St. Giles, for the Taylor Institute; T. Harold Hughes, architect. Showrooms, St. John's Road; Stephensons (Oxford), Ltd.

Paignton.—Development of Woodland Park estate; E. H. Ladbury. Extensions to lecture hall, Torquay Road; Baptist trustees.

Penrith.—Houses (120), Tyne Close estate (£36,586); P. A. Baines & Son.

Pontefract (YORKS.).—Extensions, King's School, for the borough E.C.; director of education.

Rochester.—Sports stadium, City Way (£14,000), for the Rochester and Chatham Stadium, Ltd.; J. Wilson, Chatham, chairman.

St. Ives (HUNTS.).—Houses (24), for the T.C.; Mr. Lavender, architect.

Sedgley.—Cinema, Redhill Road; A. E. G. Jones.

Sheerness.—Omnibus station, Bridge Road, for Maidstone and District Motor Services, Ltd.; secretary, Maidstone.

Sheffield.—Elementary schools, Wooley Wood and Hatfield House Lane; city architect.

Spalding.—Market and fire station (£20,000); V. G. Green, builder.

Stone (STAFFS.).—Post office for H.M. Office of Works, King Charles Street, London, S.W.

Sunderland.—Extensions to Ryhope Hospital (£142,000) for the T.C.; T. P. Collinge, borough engineer, Town Hall.

Sutton Valence (KENT).—Extensions, Eccles Hill, for General Sir Guise G. Moores.

Swanage (DORSET).—Concert hall, Shore Road, for E. R. Parsons.

Swinton and Pendlebury.—Houses (106) for the U.D.C.; surveyor.

Torquay.—Extensions to Homelands School (£3,265); Torquay Building Co., Ltd.

Wakefield.—Houses (100) for the T.C.; P. Morris, architect, Town Hall. Junior school, Upset estate; Rev. Canon Leteux.

Walsall.—Extension of Queen Mary's School; governors.

Watford.—Alterations, 89, High Street; Rego Clothiers, Ltd. Development of Leanesden estate; Watford Gardens Estate, Ltd. Post Office, Market Street; Postmaster-General.

West Riding.—Senior school (£28,000), Dinnington, and extensions, Purston and Heckmondwike schools, for the E.C.; director of education, Wakefield. Extensions to technical college at Wakefield for the E.C.; P. Morris, Town Hall, Wakefield.

West Wickham (KENT).—Development of shopping area, Langley Park estate; T. Spencer Bright, surveyor, 2, New Court, London, W.C.

Whitby (YORKS.).—Houses (52) for the U.D.C.; R. A. Wilson and Sons, builders.

Wick.—Alterations and improvements to Town Hall and Council Offices (£2,900); burgh surveyor.

Wokingham (BERKS.).—Post Office for H.M. Office of Works, King Charles Street, London, S.W.

Worcestershire.—Senior school, Evesham, for the County E.C.; director of education, Worcester.

Art in a Control Room

In the U.S.A. there has just been completed the design and construction of electrical equipment for the very artistic ultra-modern control room of the Harding Street power station of the Indianapolis Power and Light Company, a subsidiary of the Utilities Power and Light Corporation, Chicago. Every item in the general scheme will be related to every other item so skilfully that the room will have the appearance of an attractive lobby. More than twenty designs for the miniature control switches were fashioned out of steel, hard rubber, and clay before the approved model was finally evolved for use on the control desk. Harmonising with the walls and other equipment of the control room, the desk is a pastel green in colour. In addition to the ornamental design of the switches, the bright metal cover plates, the dozens of tiny red, green and white lights, the bars of copper and aluminium metal, the black operating handles and the flush-type illuminated dial instruments, the desk is so designed that all the connecting and mounting bolts are obscured from view by the flanges. This adds to the general appearance by concealing the necessary but unattractive details. Two 43,750-kVA turbo-generators will be controlled from the desk, which will be used in conjunction with two vertical steel switchboards of the swinging-panel type, one for the control and protection of h.p. line circuits, and the other for the control of station auxiliary circuits. These boards are given the same green finish as will prevail throughout the control room.